

Exhibit 7

## U.S. Court of Appeals

## Federal Circuit

Hester Industries Inc. v. Stein Inc.

Nos. 97-1352, 1353

Decided May 7, 1998

## PATENTS

## 1. Practice and procedure in Patent and Trademark Office — Reissue — Error without deceptive intent (§110.1303)

Asserted reissue claims of patent for food cooker are broader than original claims within meaning of "recapture rule," which prohibits grant of reissue claims that are broader than original claims in manner directly pertinent to subject matter surrendered during prosecution, since reissue claim that does not include limitation present in original patent claims is broader in that respect, and since reissue claims in present case do not include two limitations of original claims that require cooking "solely with steam," supplied by "two sources of steam."

## 2. Practice and procedure in Patent and Trademark Office — Reissue — Error without deceptive intent (§110.1303)

Arguments made to overcome prior art, even when made in absence of any claim amendment, can evidence admission sufficient to give rise to finding of "surrender" within meaning of "recapture rule," which prohibits grant of reissue claims that are broader than original claims in manner directly pertinent to subject matter surrendered during prosecution, since view that arguments alone can give rise to surrender is consistent with policy behind reissue statute, 35 USC 251, which is based on fundamental principles of equity and fairness, and with accompanying recapture rule, which is based on principles of equity and therefore embodies notion of estoppel.

## 3. Practice and procedure in Patent and Trademark Office — Reissue — Error without deceptive intent (§110.1303)

Applicant surrendered claim scope for food cooker patent that does not include two limitations which require cooking "solely with steam," supplied by "two sources of steam," since applicant repeatedly argued, during prosecution of original patent, that "solely with steam" and "two sources of steam" limitations distinguished original claims from prior art, and that each of these limitations was "critical" to patentability, and since these repeated arguments constitute admission by applicant that limitations were necessary to overcome prior art.

## 4. Practice and procedure in Patent and Trademark Office — Reissue — Error without deceptive intent (§110.1303)

Determining whether subject matter surrendered by argument alone during prosecution of original patent has crept back into asserted reissue claims is accomplished by simply analyzing asserted reissue claims to determine whether they were obtained in manner contrary to arguments on which surrender was based; in present case, in which asserted reissue claims of patent for food cooker do not include two original claim limitations, which required cooking "solely with steam" supplied by "two sources of steam," surrendered subject matter, namely cooking other than solely with steam and with at least two sources of steam, has crept into reissue claims.

## 5. Practice and procedure in Patent and Trademark Office — Reissue — Error without deceptive intent (§110.1303)

Asserted reissue claims of patent for food cooker, which are broader in certain respects than claims of original patent, have not been materially narrowed in other respects so as to avoid operation of "recapture rule," since limitation in reissue claims requiring use of "high humidity steam" is actually same as or broader than corresponding limitation in original claim, since limitation in reissue claims requiring use of "spiral conveyance path" for conveyor belt of device is not materially limiting, in view of corresponding means-plus-function limitation in original claim, and since "spiral conveyance path" and "high humidity steam" limitations are not aspects of invention that were overlooked during prosecution of original patent.

## 6. Practice and procedure in Patent and Trademark Office — Reissue — Same invention (§110.1305)

"Original patent" clause of reissue statute, 35 USC 251, does not include separate requirement of objective intent to claim; rather, essential inquiry is whether one skilled in art, reading specification, would identify subject matter of new claims as invented and disclosed by patentee, and to extent construct of objective intent to claim is useful, it is only one factor which sheds light on whether original patent clause is satisfied.

## Particular patents — General and mechanical — Cooker

Re. 33,510 (of 4,582,047), Williams, high humidity steam cooker with continuously running conveyor, judgment of invalidity affirmed.

Re 33,259 (of 4,582,047); Williams, high humidity steam cooker with continuously running conveyor, judgment of invalidity affirmed.

Appeal from the U.S. District Court for the Eastern District of Virginia, Ellis, J., 43 USPQ2d 1236.

Action by Hester Industries Inc. against Stein, Inc. for patent infringement. Plaintiff appeals from grant of defendant's motion for summary judgment of patent invalidity, and defendant cross-appeals from pre-trial ruling in which district court adopted plaintiff's proposed claim construction. Summary judgment of invalidity affirmed; cross-appeal dismissed.

Robert W. Adams, Robert A. Vanderhye, James T. Hosmer, Robert W. Faris, and William J. Griffin, of Nixon & Vanderhye, Arlington, Va., for plaintiff-appellant.

Charles H. De La Garza, of Arnold, White & Durkee, Minneapolis, Minn.; L. Gene Spears and James C. Pistorino, Houston, Texas, for defendant-cross-appellant.

Before Plager and Schall, circuit judges.

Plager, J.

Hester Industries, Inc. ("Hester") appeals from a summary judgment of invalidity entered by the United States District Court for the Eastern District of Virginia. The district court ruled that the reissue patent claims asserted by Hester against Stein, Inc. ("Stein") are invalid for failing to meet the statutory "error" and "original patent" requirements for reissue patents set forth in 35 U.S.C. § 251.11 (1994). *Hester Indus., Inc. v. Stein, Inc.*, 963 F. Supp. 1403, [43 USPQ2d 1236] (E.D. Va. 1997). Stein cross-appeals a pretrial oral ruling in which the district court adopted Hester's proposed construction of the claim term "high humidity steam."

Because the asserted reissue claims impermissibly recapture subject matter surrendered by Hester through deliberate argu-

ments repeatedly made to the Patent Office to overcome prior art, we hold that Hester is barred from asserting "error" within the meaning of 35 U.S.C. § 251.11. We accordingly affirm the summary judgment of invalidity. Because the asserted claims are invalid, we need not and do not reach the claim construction issue.

#### BACKGROUND

At issue in this case are two reissue patents, U.S. Patent No. Re. 33,510 (the "'510 reissue patent") and U.S. Patent No. Re. 35,259 (the "'259 reissue patent"). The two patents are reissues of the same original patent, U.S. Patent No. 4,582,047 (the "'047 patent" or "original patent"), which they replaced pursuant to 35 U.S.C. § 251.2. The patents are directed to a high humidity steam cooker having a continuously running conveyor for cooking food items such as poultry and other meat products. Hester, a processor of pre-cooked poultry and other meat products, owns the patents, and Charles E. Williams ("Williams"), a Hester employee, is the sole named inventor. After the '259 reissue patent (the second reissue) issued in 1996, Hester sued Stein, a manufacturer of industrial appliances, for allegedly infringing several reissue claims in the two reissue patents.

The two reissue patents and the original patent have the same written description; the patents differ only with respect to their claims. That written description describes an industrial-size steam cooker for cooking large quantities of food products. The cooker is described as having a cooker chamber in which a steam atmosphere is maintained. The food products are carried through the cooker chamber on a conveyor belt that runs through a spiral path. The written description teaches that efficient cooking is achieved without the loss of humidity, flavor, or appearance by maintaining a water-drop-free steam atmosphere within the chamber at near 100°C and 100% humidity, at above atmospheric pressure.

Two separate sources of steam, one internal and one external, are described for main-

The district court noted that the issuance of two reissue patents for the same original patent was a "curiosity" that appeared to be unprecedented. *Hester*, 963 F. Supp. at 1405 n.2. However, the propriety of two reissues for the same patent was not addressed below and has not been raised on appeal. Accordingly, we express no opinion on the matter.

A member of the panel that heard argument in this case was unable to continue with consideration of the case because of recusal. Pursuant to Rule 47.11 of this court, the matter was decided by the remaining members of the panel.

taining the steam atmosphere. The internal source of steam described is a pool of water on the floor of the cooker chamber, heated by a heating element in the pool. The external source described is a steam generator, located outside the cooker chamber and connected by pipes to various locations within the cooker chamber to inject steam at those locations. The written description states that the external steam source typically provides 25% of the steam, with the remainder provided by the internal source. '047 patent, col. 3, ll. 42-45, 57-59. The heating element in the internal steam source is controlled to maintain the desired amount of steam and pressure within the cooker chamber. *Id.* col. 3, ll. 59-63.

The section of the written description entitled DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT describes the cooking atmosphere thus:

The cooking is solely with water droplet free steam near 100° C. and 100% humidity at a pressure above atmospheric. The high humidity atmosphere prevents losses of humidity of the product as it passes through the cooker and helps retain juices, essences and flavor of the product. Also it improves the heating steam interface heat exchange at the product surface for more efficient cooking.

The higher pressure not only produces a pressure-cooker like cooking efficiency to the cooking process, but is critical in connection with the flavor and conveyor type product flow as well.

*Id.* col. 3, ll. 22-33.

The original patent contains one independent claim, claim 1, directed to a food cooking system. The claim specifies that the cooking system cooks solely with steam and that the system includes two sources of steam to provide the steam atmosphere. Characteristics of the steam atmosphere are set forth, and the cooking system is said to include a means passing a conveyor belt through the cooker housing. Claim 1, with relevant text emphasized, reads:

A food cooking system cooking solely with steam, foods such as fish, fowl, meats or produce, carried through a cooker, on a continuously running conveyor belt, comprising in combination, a cooker housing, means passing said conveyor belt through said housing to expose food products within the cooker housing only to said steam as the sole cooking medium; and two sources

of steam providing said steam to cook the food products; nozzles for releasing steam located inside said housing, one comprising a steam generator supplying supplemental steam into said housing at said nozzles located therein to maintain the atmosphere together with the other steam source at near 100% humidity, 100° C. and a pressure above atmospheric, and the other source of steam comprising a pool of water within said housing with heating means for boiling the water to create steam.

*Id.* col. 5, ll. 59 to col. 6, l. 8. For purposes here, this is substantially the same form in which the claim was first filed (as application claim 1) in the application for the original patent. Accordingly, we do not distinguish between the issued claim and the application claim, but instead simply refer to claim 1.

In addition to the independent claim, the original patent contains several claims which are dependent upon claim 1. Relevant here is dependent claim 12, which specifies in pertinent part: "A system as defined in claim 1 wherein the conveyor belt is passed inside said housing in a spiral path coiling downwardly." *Id.* col. 6, ll. 59-61 (emphasis added). This claim stemmed from original application claim 16, which specified that the conveyor belt is "passed in a spiral path."

The application for the '047 patent (the original patent) was filed in 1979. The patent did not issue until 1986, nearly seven years later. Over the almost seven years in which the application was prosecuted before the United States Patent and Trademark Office ("Patent Office"), inventor Williams, through his attorney, repeatedly emphasized the "solely with steam" and "two sources of steam" features of the claimed invention in attempting to establish patentability over the prior art. For example, after the Examiner first rejected claim 1, as well as all the other claims, as obvious, Office Action of Feb. 6, 1980, at 2, Williams distinguished a cited prior art cooker that cooked with a combination of infra-red dry heat and steam on the ground that the claimed invention cooked solely with steam, stating: "This principle is completely different from applicant's invention where the claims define cooking solely with steam." Applicant Response of Apr. 28, 1980, (emphasis in original). Williams also distinguished claim 1 on the basis of the "two sources of steam" limitation, the specified

characteristics of the steam atmosphere, and the recited continuously running conveyor belt. *Id.*

Application claim 16, which specified a spiral conveyance path, was rejected as obvious in view of an additional prior art cooker that included a spiral conveyor. Office Action of Feb. 6, 1980, at 4. In response, Williams amended claim 16 to specify further details of the spiral conveyance path and then argued that the claimed spiral conveyance path was distinguished from that shown in the prior art. Applicant Response of Apr. 28, 1980.

However, the Examiner continued to reject all claims as obvious. Office Action of July 9, 1980. At that point, Williams placed even greater reliance on the "solely with steam" and "two sources of steam" limitations in an attempt to overcome the obviousness rejection. For example, in his first appeal of the obviousness rejection to the Board of Patent Appeals and Interferences ("Board"), Williams stated: "The claimed system cooks *solely* with steam . . . by means of two separate and critical steam sources." Applicant Brief on Appeal at 2 (Aug. 20, 1980) (emphasis in original). Later in the same brief, Williams specifically distinguished the cited prior art on the basis of these limitations:

The primary reference, Vischer, cooks with IR radiation, not steam. Clearly the claimed feature of cooking *solely* with steam is directly contrary to the teaching of the Vischer patent, which could therefore never make obvious any process or equipment cooking *solely* with steam as claimed.

The Examiner errs in any implication that Jourdan shows two sources of steam. *Id.* at 9-10. (emphasis in original)

Prior to the Board hearing Williams' appeal, the Examiner reopened prosecution on the merits in view of newly discovered prior art, thereby removing the appeal from the Board. Office Action of Mar. 17, 1981. The Examiner then rejected all of the claims as obvious over the new prior art. *Id.* In response, Williams distinguished claim 1 over that prior art on the same bases, i.e., the "solely with steam" and "two sources of steam" limitations. Applicant Response to Office Action (Apr. 17, 1981). However, the Examiner was not persuaded, even after these same arguments were repeated in subsequent papers submitted to the Patent Office.

Accordingly, the Board never heard Williams' first appeal.

sequent papers submitted to the Patent Office.

Accordingly, Williams initiated a second appeal to the Board. He again emphasized the "solely with steam" and "two sources of steam" limitations. Applicant Brief on Appeal, at 13 (Dec. 22, 1981). He explained that the two sources of steam interact to provide a "synergy" that is "novel and nowhere suggested in any of the cited [prior] art." *Id.* Williams drove home his reliance on the "solely with steam" limitation most forcefully in his reply brief to the Board: "Clearly the Examiner reversibly errs as a matter of fact and in his efforts to make a case out against the *very material claimed feature that steam is the sole cooking medium (claim 1)*. Thus reversal is respectfully solicited." Applicant Reply Brief on Appeal at 6 (Sep. 30, 1982) (emphasis in original).

The Board was persuaded and accordingly reversed the obviousness rejection in its opinion dated June 21, 1985, stating:

[W]e find no suggestion in the combined teachings of the references which would have led the ordinarily skilled worker in the art to an apparatus utilizing steam as the sole cooking medium, utilizing two separate sources of steam, one of which includes a pool of water in the cooking chamber with means for boiling the water; and wherein the atmosphere within the cooking chamber is maintained above atmospheric by the two sources of steam.

Thereafter the claims were allowed and the application issued as the '047 patent on April 15, 1986.

On the two-year anniversary of the '047 patent's issuance, Williams applied for a reissue pursuant to 35 U.S.C. § 251, alleging that the patent claims had been drawn too narrowly due to attorney error. In the required oath accompanying the reissue application, Williams explained that he became aware of this alleged error after learning that Stein was in the process of developing a competing cooker in early 1988. According to his oath, Williams and his employer Hester concluded that the '047 patent should cover the Stein cooker, notwithstanding the fact that the cooker used a non-steam heat source and only one source of steam in the cooking process. Williams further explained that Hester's present counsel advised Hester that the '047 patent claims, as written, might not cover Stein's cooker. Thus, Williams, by oath, declared that the patent was insufficient because it claimed less than he had a right to claim.

Specifically, Williams identified two relevant deficiencies of the '047 patent, as follows (indentation and numbering added):

[1] that each of claims 1-14 therein requires cooking "solely with steam" and exposing food products within the cooker housing "only to said steam as the sole cooking medium" [and];

[2] that each of claims 1-14 therein requires "two sources of steam providing said steam to cook the food products, nozzles for releasing steam located inside said housing" [and];

These deficiencies, according to Williams, "arose after [he] executed and filed the original application from which the '047 patent issued" and were caused by "the failure of [his prior] patent attorney . . . to appreciate the full scope of [his] invention."

This application ripened into the '510 reissue patent nearly three years later on January 1, 1991. However, prior to its issuance, Williams filed a second reissue application, for reasons not relevant here, on June 21, 1990, alleging the same errors used to support the first reissue. Six years later, this second reissue application issued as the '259 reissue patent. Hester then filed this action, accusing Stein of infringing two claims in the first reissue patent and six claims in the second. Specifically, Hester accused Stein of infringing reissue claims 26 and 59 of the '510 reissue patent and reissue claims 28, 30, 31, 32, 75, and 76 of the '259 reissue patent.

The requirement in original claim 1 that cooking is "solely with steam" is absent from each of the asserted reissue claims. Also absent is the "two sources of steam" limitation. Rather, the asserted reissue claims merely recite a source of steam or, at least, one source of steam. None of the asserted reissue claims explicitly recite the steam atmosphere characteristics specified in original claim 1, i.e., the characteristics of near 100°C and 100% humidity at above atmospheric pressure. Instead, all but one of the asserted reissue claims recite the following language:

The reissue oath specifies two further insufficiencies, namely, that the '047 patent requires:

[3] "a steam generator supplying supplemental steam into said housing at said nozzles located therein to maintain the atmosphere together with the other steam source at near 100% humidity, 100°C and a pressure above atmospheric" and

[4] "a pool of water within the housing with heating means for boiling the water to create steam." (Indentation and numbering added.)

asserted reissue claims recite "high humidity steam." Claim 26 of the '510 reissue patent is representative of the two asserted reissue claims in that patent. It provides in pertinent part:

A food cooking system for cooking food products carried on a moving conveyor belt comprising a cooker housing [and]

means disposed within said housing for defining a conveyance path

a conveyor belt disposed along said conveyance path for supporting and conveying said food products along said path, means coupled to said belt for causing said belt and said food products supported thereby to substantially continually translate along said conveyance path, and

a source of steam providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an external steam generator supplying steam into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam. [and]

wherein said steam source provides high humidity steam and said food products are directly exposed to said high humidity steam.

'510 patent, col. 8, ll. 8-31, 36-38 (emphasis added, and text of claim 24, upon which claim 26 depends, incorporated).

The asserted reissue claims of the '259 reissue patent are, for purposes here, substantially similar. One difference is that several of these claims explicitly recite a "spiral conveyance path." Claim 28, which is representative, provides in pertinent part:

A spiral steam cooker for at least partially cooking exposed food products, said cooker comprising:

a housing defining an internal volume therein;

a conveyor belt at least partially disposed along a spiral conveyance path within said internal volume; and

a steam source operatively coupled to said housing, said steam source providing a high humidity steam atmosphere within said internal volume, said high humidity steam atmosphere directly contacting and at least partially cooking the exposed food products.

'259 patent, col. 9, l. 61 to col. 10, l. 12 (emphasis added).

Claim 30 of the '259 reissue patent does not contain the "high humidity steam" language.



Before the district court, Stein moved for summary judgment that the asserted reissue claims are invalid for failing to meet the requirements of the reissue statute, 35 U.S.C. § 251. That section (with emphasis added) reads:

Whenever any patent is, through error without any deceptive intention, deemed wholly or partly inoperative or invalid, by reason of a defective specification or drawing, or by reason of the patentee claiming more or less than he had a right to claim in the patent, the Commissioner shall, on the surrender of such patent and the payment of the fee required by law, reissue the patent for the invention disclosed in the original patent, and in accordance with a new and amended application, for the unexpired part of the term of the original patent. No new matter shall be introduced into the application for reissue.

In particular, Stein argued that the "error" requirement of § 251(1), as well as the requirement therein that the reissue claims be "for the invention disclosed in the original patent" (the "original patent" requirement), were not met. With regard to the "error" requirement, Stein argued that Williams had not erred in including the "solely with steam" and "two sources of steam" limitations in the original claims, and further argued that the removal of those limitations violated the "recapture" rule. Stein further argued that the asserted reissue claims violated the "original patent" requirement because, Stein asserted, the original patent does not evidence an "objective" intent to claim the invention in the manner of the asserted reissue claims.

The district court granted Stein's motion. The court first concluded that there was no "error" as contemplated by § 251(1). Specifically, the court concluded that the alleged failure of counsel to appreciate the scope of the invention was belied by the clear language in the original patent claims, the prosecution history of the patent, and the absence of any explanation as to the nature or cause of the attorney's failure to appreciate the full scope of the invention. *Hester*, 963 F. Supp. at 1408. The court did not reach Stein's assertion that the asserted reissue claims violate the recapture rule, though the court relied heavily on the original patent's prosecution history in determining that the "error" requirement was not met. *See id.* at 1409-11.

The district court ruled that the asserted reissue claims are alternatively invalid for failing to meet the "original patent" requirement. *Id.* at 1412. The district court conclud-

ed that the "original patent" clause of § 251(1) includes a separate requirement that the original patent manifest an "objective" intent to claim the invention as later claimed on reissue. *Id.* at 1412-13. The court concluded that the original patent does not manifest such an objective intent, and thus the claims are also invalid under the "original patent" clause of § 251(1). *Id.* at 1412-15.

In its appeal of the invalidity judgment, Hester argues that the district court erred in concluding that the "error" and "original patent" requirements of § 251(1) were not met. Stein, in seeking to uphold the judgment, makes the same arguments presented to the district court in its motion for summary judgment. Hester, on the other hand, argues that the "error" requirement was met by way of prior patent counsel's failure to appreciate the full scope of the invention. Hester further asserts that the recapture rule is inapplicable because the reissue claims were never presented during prosecution of the original patent and later abandoned by amendment or cancellation. With regard to the "original patent" clause of § 251(1), Hester submits that there is no separate requirement of a manifestation of an objective intent to claim.

Also at issue on appeal is the district court's resolution of a "Motion For Claim Interpretation" brought by Stein. In that motion, Stein argued that the claim term "high humidity steam" should be construed in accordance with the only specific description of the steam atmosphere provided in the patents, i.e., as water-droplet-free steam near 100°C and 100% humidity at above atmospheric pressure. Hester, relying on the opinion of its expert, proposed a broader construction, arguing that the description contained in the patents is merely one example of "high humidity steam." The district court, in a ruling delivered from the bench prior to holding the asserted reissue claims invalid, adopted Hester's proposed construction of the claim term. The ruling was never reduced to a formal order or judgment. The parties, by way of cross-appeal by Stein, present the same issue on appeal.

#### DISCUSSION

In reviewing the summary judgment of invalidity, we keep in mind that summary judgment is appropriate only when the record shows that "there is no genuine issue as to any material fact and that the moving party is entitled to judgment as a matter of

law." Fed. R. Civ. P. 56(c). Whether the statutory requirements of 35 U.S.C. § 251 have been met is a question of law. See *In re Clement*, 131 F.3d 1464, 1468, 45 USPQ2d 1161, 1163 (Fed. Cir. 1997). This legal conclusion can involve underlying factual questions. See *id.*

As previously explained, the "error" and "original patent" requirements at issue here are found in the first paragraph of § 251. The "error" requirement limits the availability of a reissue patent to certain correctable errors. See *In re Amos*, 953 F.2d 613, 616, 21 USPQ2d 1271, 1273 (Fed. Cir. 1991). As seen in the above-emphasized text of § 251, one such correctable error is the patentee claiming his invention "too broadly or too narrowly." See *id.*

The "original patent" requirement is a second and independent requirement; see *Amos*, 953 F.2d at 615, 21 USPQ2d at 1272, which restricts a reissue patent to "the invention disclosed in the original patent." 35 U.S.C. § 251 ¶ 1. We address each of these requirements in turn.

As previously explained, the "error" requirement is based on fundamental principles of equity and fairness, and should be construed liberally. See *In re Weiler*, 790 F.2d 1576, 1579, 229 USPQ 673, 675 (Fed. Cir. 1986). We also keep in mind that "not every event or circumstance that might be labeled 'error' is correctable by reissue." *Id.* Indeed, the reissue procedure does not give the patentee the right "to prosecute *de novo* his original application." *Id.* at 1582, 229 USPQ at 677; see also *Mentor Corp. v. Coloplast, Inc.*, 998 F.2d 992, 995, 27 USPQ2d 1521, 1524 (Fed. Cir. 1993).

In considering the "error" requirement, we keep in mind that the reissue statute is "based on fundamental principles of equity and fairness, and should be construed liberally." *In re Weiler*, 790 F.2d 1576, 1579, 229 USPQ 673, 675 (Fed. Cir. 1986). We also keep in mind that "not every event or circumstance that might be labeled 'error' is correctable by reissue." *Id.* Indeed, the reissue procedure does not give the patentee the right "to prosecute *de novo* his original application." *Id.* at 1582, 229 USPQ at 677; see also *Mentor Corp. v. Coloplast, Inc.*, 998 F.2d 992, 995, 27 USPQ2d 1521, 1524 (Fed. Cir. 1993).

One of the most commonly asserted "errors" in support of a broadening reissue is the failure of the patentee's attorney to appreciate the full scope of the invention during the prosecution of the original patent application. See *Amos*, 953 F.2d at 616, 21 USPQ2d at 1272.

USPQ2d at 1273; *In re Wilder*, 736 F.2d 1516, 1519, 222 USPQ 369, 371 (Fed. Cir. 1984). This form of error has generally been accepted as sufficient to satisfy the "error" requirement of § 251. See *Clement*, 131 F.3d at 1468, 45 USPQ2d at 1163; *Wilder*, 736 F.2d at 1519, 222 USPQ at 371. Williams asserted this form of error as the basis for his reissue applications, and the Patent Office accepted his assertion as adequate.

However, the district court concluded that there was no such error by Williams' attorney. *Hester*, 963 F. Supp. at 1411. In reaching this conclusion, the court was particularly persuaded by the prosecution history of the original patent. The court concluded that the attorney's repeated attempts to distinguish Williams' invention on the basis of the "solely with steam" and "two sources of steam" limitations belied Williams' assertion that his attorney failed to appreciate the full scope of his invention. *Id.* at 1409-11. The court also determined that there was no other form of § 251 "error" and thus held the asserted reissue claims invalid. *Id.* at 1411-12.

We share the district court's discomfort with Williams' attempt to remove, through reissue, the "solely with steam" and "two sources of steam" limitations after having relied so heavily on those limitations to obtain allowance of the original patent claims over the prior art. This concern is addressed most squarely by the "recapture rule," recently discussed at length in *Clement*, 131 F.3d 1464, 45 USPQ2d 1161. The recapture rule "prevents a patentee from regaining through reissue... subject matter that he surrendered in an effort to obtain allowance of the original claims." *Clement*, 131 F.3d at 1468, 45 USPQ2d at 1164. The rule is rooted in the "error" requirement in that such a surrender is not the type of correctable "error" contemplated by the reissue statute. See *Mentor*, 998 F.2d at 995-96, 27 USPQ2d at 1525.

We share the district court's discomfort with Williams' attempt to remove, through reissue, the "solely with steam" and "two sources of steam" limitations after having relied so heavily on those limitations to obtain allowance of the original patent claims over the prior art. This concern is addressed most squarely by the "recapture rule," recently discussed at length in *Clement*, 131 F.3d 1464, 45 USPQ2d 1161. The recapture rule "prevents a patentee from regaining through reissue... subject matter that he surrendered in an effort to obtain allowance of the original claims." *Clement*, 131 F.3d at 1468, 45 USPQ2d at 1164. The rule is rooted in the "error" requirement in that such a surrender is not the type of correctable "error" contemplated by the reissue statute. See *Mentor*, 998 F.2d at 995-96, 27 USPQ2d at 1525.

In its motion for summary judgment, Stein presented the recapture rule as one basis for finding the asserted reissue claims invalid, and Stein repeats this argument on appeal as one basis for affirming the summary judgment of invalidity. While the district court did not explicitly rule on this ground, its opinion indicates the view that Hester, through the reissue patents, recaptured surrendered subject matter. *Hester*, 963 F. Supp. at 1412 (stating that through the reissues, Hester obtained claims covering

"ovens with characteristics repeatedly distinguished and disclaimed in the PTO" and that that was contrary to the "error" requirement of § 251). As will be next explained, we conclude that the asserted reissue claims violate the recapture rule and that the summary judgment ruling is appropriately affirmed on this ground.

[1] "Under [the recapture] rule, claims that are 'broader than the original patent claims in a manner directly pertinent to the subject matter surrendered during prosecution' are impermissible." *Clement*, 131 F.3d at 1468, 45 USPQ2d at 1164 (quoting *Mentor*, 998 F.2d at 996, 27 USPQ2d at 1525). Application of the recapture rule begins with a determination of whether and in what respect the reissue claims are broader than the original patent claims. See *id.* A reissue claim that does not include a limitation present in the original patent claims is broader in that respect. See *id.* Here, it is undisputed that the asserted reissue claims are broader than the original patent claims in that the reissue claims do not include the "solely with steam" and "two sources of steam" limitations found in each of the original patent claims.

Having determined that the reissue claims are broader in these respects, under the recapture rule we next examine whether these broader aspects relate to surrendered subject matter. See *id.* at 1468-69, 45 USPQ2d at 1164. "To determine whether an applicant surrendered particular subject matter, we look to the prosecution history for arguments and changes to the claims made in an effort to overcome a prior art rejection." *Id.* at 1469, 45 USPQ2d at 1164 (emphasis added). This statement in *Clement* indicates that a surrender can occur by way of arguments or claim changes made during the prosecution of the original patent application. To date, the cases in which this court has found an impermissible recapture have involved claim amendments or cancellations. See, e.g., *id.* at 1469-70, 45 USPQ2d at 1164-65; *Mentor*, 998 F.2d at 995-96, 27 USPQ2d at 1524-25. However, in addition to the suggestion in *Clement* that argument alone can effect a surrender, this court expressly left open that possibility in *Ball Corp. v. United States*: "If reissue is sought where claims have not been previously canceled, analysis becomes more difficult. In that case relative claim scope is not available to illuminate the alleged error. We are not faced with that situation in this proceeding." 729 F.2d 1429, 1436 n.19, 221 USPQ 289, 295 n.19 (Fed. Cir. 1984). Prior to this case, this court has not squarely addressed the question

This court's prior opinions indicate that, as a general proposition, in determining whether there is a surrender, the prosecution history of the original patent should be examined for evidence of an admission by the patent applicant regarding patentability. See *Clement*, 131 F.3d at 1468, 45 USPQ2d at 1164 (noting that, with regard to claim amendments, the recapture rule does not apply in the absence of evidence that the amendment was an admission that the scope of the claim was not patentable); *Mentor*, 998 F.2d at 995, 27 USPQ2d at 1524 (same); *Seattle Box Co. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 826, 221 USPQ 568, 574 (Fed. Cir. 1984) (declining to apply the recapture rule when there was no evidence that the amendment was in any sense an admission that the scope of [the] claim was not patentable"). In this regard, claim amendments are relevant because an amendment to overcome a prior art rejection evidences an admission that the claim was not patentable. See *Mentor*, 998 F.2d at 995-96, 27 USPQ2d at 1524-25 (finding surrender by way of claim amendments); *Ball*, 729 F.2d at 1436, 221 USPQ at 294 (noting that a court may draw inferences from changes in claim scope).

[2] Arguments made to overcome prior art can equally evidence an admission sufficient to give rise to a finding of surrender. Indeed, in *Mentor* and *Clement* the findings of a surrender were based in part on the arguments made in conjunction with the claim amendments. *Mentor*, 998 F.2d at 995-96, 27 USPQ2d at 1524-25; *Clement*, 131 F.3d at 1470-71, 45 USPQ2d at 1165-66. Logically, this is true even when the arguments are made in the absence of any claim amendment. Amendment of a claim is not the only permissible predicate for establishing a surrender.

The view that arguments alone can give rise to a surrender is consistent with the policy behind the reissue statute and the accompanying recapture rule. As already noted, the reissue statute is "based on fundamental principles of equity and fairness." *Weiler*, 790 F.2d at 1579, 229 USPQ at 1675. There is no unfairness in binding the patentee to deliberate assertions made in order to obtain allowance of the original patent claims over the prior art. Indeed, fairness to the public must also be considered. In this regard, as stated in *Mentor*, "the reissue statute cannot be construed in such a way that competitors, properly relying on prosecution history, become patent infringers when they do so." 998 F.2d at 996, 27 USPQ2d at 1525. The recapture rule operates to prevent this from happening. See



*id.* Furthermore, as recognized in *Ball*, the recapture rule is based on principles of equity and therefore embodies the notion of estoppel. 729 F.2d at 1439; 221 USPQ at 296. Indeed, the recapture rule is quite similar to prosecution history estoppel, which prevents the application of the doctrine of equivalents in a manner contrary to the patent's prosecution history. See *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 117 S. Ct. 1040, 1051 [41 USPQ2d 1865] (1997). Like the recapture rule, prosecution history estoppel prevents a patentee from regaining subject matter surrendered during prosecution in support of patentability. See *id.*

Hester argues that an analogy cannot be made with prosecution history estoppel because the reissue procedure and prosecution history estoppel are the antithesis of one another. Reissue allows an expansion of patent rights whereas prosecution history estoppel is limiting. However, Hester's argument is unpersuasive. The analogy is not to the broadening aspect of reissues. Rather, the analogy is with the recapture rule, which restricts the permissible range of expansion through reissue just as prosecution history estoppel restricts the permissible range of equivalents under the doctrine of equivalents.

This court earlier concluded that prosecution history estoppel can arise by way of unmistakable assertions made to the Patent Office in support of patentability, just as it can by way of amendments to avoid prior art. See, e.g., *Texas Instruments, Inc. v. International Trade Comm'n*, 998 F.2d 1165, 1174, 26 USPQ2d 1018, 1025 (Fed. Cir. 1993). The same reasoning that led us to conclude that arguments alone can give rise to prosecution history estoppel lends support to the proposition that arguments alone can give rise to a surrender for purposes of the recapture rule.

Thus we conclude that, in a proper case, a surrender can occur through arguments alone. We next evaluate whether such a surrender occurred here with respect to the "solely with steam" and "two sources of steam" limitations, the pertinent aspects in which the asserted reissue claims are broader than the original patent claims. The obvious conclusion is that there has been a surrender.

[3] As detailed above, Williams repeatedly argued that the "solely with steam" and "two sources of steam" limitations distinguished the original claims from the prior art. These were Williams' primary bases for distinguishing the broadest claim, independent claim 1, from the prior art. At no less than 27 places in six papers submitted to the Patent Office, Williams asserted that the

"solely with steam" limitation distinguished the claimed invention from the prior art, and Williams did the same with respect to the "two sources of steam" limitation at no less than 15 places in at least five papers.

Williams argued that each of these limitations was critical with regard to patentability, and Williams further stated that the "solely with steam" limitation was "very material" in this regard. In essence, these repeated arguments constitute an admission by Williams that these limitations were necessary to overcome the prior art. Indeed, when the Board reversed the Examiner's rejection of the original claims, these were the primary bases indicated for patentability. Williams, through his admission effected by way of his repeated prosecution arguments, surrendered claim scope that does not include these limitations.

[4] Having concluded that there has been a surrender, we must next determine whether the surrendered subject matter has crept back into the asserted reissue claims. See *Clement*, 131 F.3d at 1469, 45 USPQ2d at 1164. When the surrender occurs by way of claim amendment or cancellation, "[c]omparing the reissue claim with the canceled claim is one way to do this." See *id.* This analysis is not available when the surrender is made by way of argument alone. Instead, in this case, we simply analyze the asserted reissue claims to determine if they were obtained in a manner contrary to the arguments on which the surrender is based.

Clearly they were. None of the asserted reissue claims include either the "solely with steam" limitation or the "two sources of steam" limitation. Thus, this surrendered subject matter — i.e., cooking other than solely with steam and with at least two sources of steam — has crept into the reissue claims. The asserted reissue claims are unmistakably broader in these respects.

Finally, because the recapture rule may be avoided in some circumstances, we consider whether the reissue claims were materially narrowed in other respects. See, e.g., *Mentor*, 998 F.2d at 996, 27 USPQ2d at 1525 ("Reissue claims that are broader in certain respects and narrower in others may avoid the effect of the recapture rule."); *Clement*, 131 F.3d at 1470, 45 USPQ2d at 1165. For example, in *Ball* the recapture rule was avoided because the reissue claims were sufficiently narrowed (described by the court as "fundamental narrowness") despite the broadened aspects of the claims. 729 F.2d at 1438; 221 USPQ at 296. In the context of a surrender by way of argument, this principle, in appropriate cases, may operate to overcome the recapture rule when the reissue

claims are materially narrower in other overlooked aspects of the invention. The purpose of this exception to the recapture rule is to allow the patentee to obtain through reissue a scope of protection to which he is rightfully entitled for such overlooked aspects.

[5] However, this is not such a case. The asserted reissue claims are not materially narrower, despite Hester's arguments to the contrary. Hester argues that the claims are materially narrower by the addition of the "spiral conveyance path" and "high humidity steam" limitations. The term "high humidity steam" is included in each of the asserted reissue claims except reissue claim 30 of the '259 reissue patent. However, the term "high humidity steam" is actually the same as or broader than the limitation in original claim 1—that this term replaced. Original claim 1 specifies a steam atmosphere "at near 100% humidity, 100° C. and a pressure above atmospheric." '047 patent, col. 6, ll. 3-4. Hester concedes that the term "high humidity steam" is not narrower than this limitation in original claim 1. In fact, with respect to the claim construction issue, Hester argues that the limitation in original claim 1 is but one example of "high humidity steam." Accordingly, the use of the term "high humidity steam" does not save the reissue claims from the recapture rule.

The term "spiral conveyance path" is also not materially limiting. This term appears explicitly in asserted reissue claims 28, 32, 75, and 76 of the '259 reissue patent; it does not appear explicitly in the other reissue claims asserted. Original claim 1 includes a corresponding limitation, namely, "means passing said conveyor belt through said housing." This is a so-called means-plus-function clause drafted pursuant to 35 U.S.C. § 112 ¶ 6 (1994). According to § 112 ¶ 6, the clause is to be construed to "cover the corresponding structure described in the specification and equivalents thereof." The only corresponding structure described in the specification (more properly, the written description of the patent) passes the conveyor belt through a spiral path. See '047 patent, col. 4, ll. 64 to col. 5, ll. 8. Thus, the explicit recitation of a "spiral conveyance path" in

Use of the word "means" in a claim clause triggers a presumption that § 112 ¶ 6 applies. See *York Prods., Inc. v. Central Tractor Farm & Family Ctr.*, 99 F.3d 1568, 1574, 40 USPQ2d 1619, 1623-24 (Fed. Cir. 1996). The presumption can be overcome if the clause recites sufficient structure. See *id.* The clause at issue here recites no structure for performing the function of passing the conveyor belt through the housing. Accordingly, § 112 ¶ 6 unquestionably applies.

some of the asserted reissue claims does not materially narrow those claims. Indeed, Hester does not explain how the explicit recitation of a spiral conveyance path—which is present in prior art cookers cited by the examiner during the prosecution of the original patent—materially narrows these claims. In sum, neither alone nor together do the terms "high humidity steam" and "spiral conveyance path" materially narrow the claims.

Furthermore, the "spiral conveyance path" and "high humidity steam" limitations are not aspects of the invention that were overlooked during prosecution of the original patent. To the contrary, as just explained, these aspects were included in original claim 1. Additionally, with regard to the "spiral conveyance path" limitation, original dependent claim 12 explicitly recites "a spiral path." '047 patent, col. 6, ll. 60. In prosecuting the original patent, Williams pointed out these features in an attempt to overcome the Examiner's obviousness rejection. Hester cannot now argue that Williams overlooked these aspects during the prosecution of the original patent application. In conclusion, this is not a case which involves the addition of material limitations that overcome the recapture rule.

In effect, Hester, through eight years of reissue proceedings, prosecuted Williams' original patent application anew, this time placing greater emphasis on aspects previously included in the original patent claims and removing limitations repeatedly relied upon to distinguish the prior art and described as "critical" and "very material" to the patentability of the invention. The reissue statute is to be construed liberally, but not that liberally. The realm of corrections contemplated within § 251 does not include recapturing surrendered subject matter without the addition of materially narrowing limitations, in an attempt to custom-fit the reissue claims to a competitor's product.

No doubt if two patent attorneys are given the task of drafting patent claims for the same invention, the two attorneys will in all likelihood arrive at somewhat different claims of somewhat different scope. And such differences are even more likely when, as here, the second attorney drafts the new claims nearly a decade later and with the distinct advantage of having before him the exact product offered by the now accused infringer. This reality does not justify recapturing surrendered subject matter under the mantra of "failure to appreciate the scope of the invention." The circumstances of the case before us simply do not fit within the concept of "error" as contemplated by the

reissue statute. See *Mentor*, 998 F.2d at 996; 27 USPQ2d at 1525. ("Error under the reissue statute does not include a deliberate decision to surrender specific subject matter in order to overcome prior art, a decision which in light of subsequent developments in the marketplace might be regretted.")

With respect to the recapture issue, there are no underlying material facts as to which there is a genuine issue in dispute. The original patent's prosecution history, on which we rely, is before us and undisputed. All that remains is the ultimate legal conclusion as to whether the asserted reissue claims fail to meet the "error" requirement because the claims impermissibly recapture surrendered subject matter. See *id.* at 994; 27 USPQ2d at 1524 (stating that whether the "error" requirement has been met is a legal conclusion). For the reasons explained above, we conclude as a matter of law that the asserted reissue claims fail in this regard. Summary judgment of invalidity of the asserted reissue claims under § 251 is called for. Accordingly, we affirm the district court's entry of summary judgment.

#### B.

As an alternative basis for holding the asserted reissue claims invalid, the district court concluded that the reissue claims do not meet the "original patent" clause of § 251(1), which requires that the reissue patent be "for the invention disclosed in the original patent." *Hester*, 963 F. Supp. at 1412. In reaching this conclusion, the court interpreted the "original patent" clause as requiring an "objective" intent, manifested in the original patent, to claim the invention as claimed in the reissue patent. *Id.* The court based this interpretation on the Supreme Court's statement in *U.S. Industrial Chemicals, Inc. v. Carbide & Carbon Chemicals Corp.*, 315 U.S. 668, 676 [53 USPQ 6] (1942), that there was an objective intent requirement under the predecessor reissue statute, 35 U.S.C. § 64 (1964), which required that the reissue patent be "for the same invention." *Id.* at 1413.

Based on this construction of the "original patent" clause, the district court framed the issue as, "whether the 047 patent manifests an objective intent to cover ovens that utilize heat sources other than steam, and have less than two steam sources." *Id.* The district court concluded that the asserted reissue claims failed to meet this test and thus were invalid under the "original patent" clause. *Id.* at 1413-15. On appeal, the parties focus on whether the "original patent" clause em-

bodies the requirement of an objective intent to claim.

[6] This court squarely addressed the issue in *Amos*, 953 F.2d at 616; 21 USPQ2d at 1273. The *Amos* court held that § 251 does not include a separate requirement of an objective intent to claim. 953 F.2d at 618-19; 21 USPQ2d at 1275-76. Rather, the court concluded: "the essential inquiry under the 'original patent' clause of § 251 is whether one skilled in the art, reading the specification, would identify the subject matter of the new claims as invented and disclosed by the patentees." *Id.* at 618; 21 USPQ2d at 1275. The court noted that this inquiry is analogous to the "written description" requirement of 35 U.S.C. § 112(1) (1994). *Id.* The court further stated that, to the extent the construct of an objective intent to claim is useful, it is "only one factor that sheds light" on whether the "original patent" clause of § 251 is satisfied. *Id.* at 619 & n.2; 21 USPQ2d at 1275-76 & n.2 (quoting *In re Hounsfield*, 699 F.2d at 1320, 1323, 216 USPQ 1045, 1047-48 (Fed. Cir. 1983)).

With regard to the Supreme Court's opinion in *U.S. Industrial*, 315 U.S. 668, the *Amos* court noted that that case was decided under the predecessor reissue statute which required reissue claims to be for the "same invention," and concluded that *U.S. Industrial* does not now mandate a separate "objective intent to claim" requirement. *Id.* The *Amos* court noted that this court reached the same conclusion eight years earlier in *Hounsfield*, 699 F.2d at 1323, 216 USPQ at 1047-48. *Id.*

Thus, the district court's conclusion that the "original patent" clause of § 251 was not satisfied based on an "objective intent to claim" requirement was in error. Stein does not contend that the test set forth in *Amos* for the "original patent" clause — i.e., whether one skilled in the art would identify the subject matter of the reissue claims as invented and disclosed by the patentee — is not met by the asserted reissue claims. Rather, Stein relies entirely on its assertion that there is an "objective intent to claim" requirement and that that requirement is not met. However, we need not resolve this issue further, having already concluded that the asserted reissue claims are invalid for failing to meet the "error" requirement of § 251.

Finally, Stein presents to us the question of whether the district court properly construed the claim term "high humidity steam." It is not immediately apparent whether this issue is properly before us. The

district court did not construe the term in conjunction with a final judgment, such as a summary judgment of noninfringement or invalidity. Rather, the district court issued an oral ruling on the matter in preparation for trial. However, the district court having held the asserted claims invalid on summary judgment, which we here affirm, there can be no question of liability and hence the claim construction issue is moot. Therefore, we need not decide whether Stein's appeal of the claim construction is proper, and if so, whether the district court's construction was correct.

#### CONCLUSION

We affirm the grant of summary judgment of invalidity of the asserted reissue claims for failure to comply with 35 U.S.C. § 251 (1). Stein's cross appeal is dismissed.

#### COSTS

Each party shall bear its own costs.

#### AFFIRMED

U.S. District Court

District of New Jersey

Jews for Jesus v. Brodsky

No. 98-274 (AJL)

Decided March 6, 1998

#### TRADEMARKS AND UNFAIR TRADE PRACTICES

1. Acquisition, assignment, and maintenance of marks — Scope of trademark — In general (§305.0201)

Infringement; conflicts between marks — In general (§335.01)

Owner of registered trademark "Jews for Jesus" has rights in phrase "Jews for Jesus" as used in Internet domain names, even though phrase does not contain stylized letter "O" in plaintiff's mark, since domain names, for technical reasons, cannot contain stylized letters, and since holding that mark owner lacks rights in phrase without registered mark's unique characteristic, such as script lettering or symbol, would enable party to use trademark of another where factors beyond control of mark's owner make it impossible to adequately depict mark.

2. Infringement; conflicts between marks — Likelihood of confusion — Particular marks — Confusion likely (§335.0304.03)

Phrase "Jews for Jesus" in Internet domain name used by defendant appears to be confusingly similar to plaintiff's registered mark "Jews for Jesus," since exact similarities are not required between allegedly confusing marks in order to constitute infringement, and since, considering that defendant's domain name is nearly identical to plaintiff's mark, it is likely that Internet users will conclude that registered mark name of plaintiff non-profit organization, and defendant's domain name share common source, affiliation, connection, or sponsorship.

3. Types of marks — Generic — Particular marks (§327.0603)

Common law service mark "Jews for Jesus" is not generic phrase for "Jews" who are "for Jesus," since during past 24 years, plaintiff non-profit organization has consistently used phrase to refer to organization itself, since there are several other names that could be used to refer to individuals of Jewish heritage who believe in Jesus, and since plaintiff's use of phrase does not leave so few alternatives as to monopolize concept and debilitate potential competitors.

4. Types of marks — Descriptive — Particular marks (§327.0303)

Common law service mark "Jews for Jesus" is descriptive, rather than suggestive, of organization whose members are individuals of Jewish heritage who believe in Jesus, since culling direct message from mark does not require much imagination or thought, and since mark does not conjure up purely arbitrary connotation.

5. Types of marks — Secondary meaning (§327.02)

Common law service mark "Jews for Jesus" used by plaintiff non-profit organization appears to have acquired secondary meaning, since plaintiff organization has expended considerable amount of money on advertising over past 10 years, has received extensive media coverage in connection with its teachings and mission, and has been successful in its marketing efforts, and since mark appears to have been in continuous use by plaintiff and/or its predecessor organizations since 1973.

spiral path 18 and its associated drive mechanisms. The catwalk array 69 gives a size perspective of the cooker housing 16, and provides access to top entry panels and the mechanism 68 for maintenance. The spiral belt path may have as many convolutions as necessary to retain particular specialty products within the cooking chamber a desired dwell time for the desired belt travel speed.

Details of the heating mechanisms are shown in FIG. 5. For sanitary purposes stainless steel is used wherever possible and the interior walls of the housing 16 are smooth to avoid any surfaces that could cause dripping or collect contamination. The interior 70 of the housing walls is insulated to preserve heat and to produce a safe and lower temperature outside wall environment around operational personnel.

The steam generator unit 30 could be any standard commercially available steam generator unit and is preferably made of stainless steel. It is coupled to a boiler for a supply of sanitary steam from pure water by means of piping 71. Approved pure water make-up is entered from source 31 to assure sanitary steam. All piping is stainless steel sanitary steam pipe with pipe insulation having sanitary jacketing.

The floor water may be pumped out by pump 75 through drain 76 when sanitizing by detergents from piping 56.

The fat skimmer duct 48 has internal baffling to reduce the loss of hot water and it leads to a settling tank (not shown) for segregation of fats.

The external steam is preferably disposed through piping 78 to the four corners of the cooking chamber and steam is released at nozzles 32', 33' or along the length of the piping such as shown at 79 to provide proper mixture and saturation along the spiral conveyor path with the steam evaporated from the lower water pool.

Externally the cooking cabinet 16 is shown in FIG. 6. The top housing 80 encloses the mechanisms for driving the spiral conveyor system within housing 16 and the top access door 81 permits entry for maintenance, inspection, sanitation and the like.

It is therefore evident that the steam cooking system provided by this invention has advanced the state of the art and provided many improved features. Those novel features believed descriptive of the spirit and nature of the invention are set forth with particularity in the appended claims.

#### INDUSTRIAL APPLICATION

Large volumes of food products are processed on a continuously running conveyor belt passing through an energy efficient steam cooker which preserves product humidity, flavor and appearance. Thus, fish, meat, poultry, produce and like food products can be cooked. There are self-cleaning and apparatus features for meeting the strictest of sanitation requirements.

I claim:

1. A food cooking system cooking solely with steam foods such as fish, fowl, meats or produce carried through a cooker on a continuously running conveyor belt, comprising in combination, a cooker housing, means passing said conveyor belt through said housing to expose food products within the cooker housing only to said steam as the sole cooking medium, and two sources of steam providing said steam to cook the food products, nozzles for releasing steam located inside said housing, one comprising a steam generator supplying

supplemental steam into said housing at said nozzles located therein to maintain the atmosphere together with the other steam source at near 100% humidity 100° C. and a pressure above atmospheric, and the other source of steam comprising a pool of water within said housing with heating means for boiling the water to create steam.

2. The system defined in claim 1 having a steam exhaust pipe, and heat control means for said pool of water regulated as a function of the temperature at said exhaust pipe.

3. The system defined in claim 1 having an opening in said housing into which said conveyor belt passes, and means establishing said steam pressure at a sufficient magnitude to discharge steam at a controlled rate from said housing about the entering conveyor belt.

4. The system defined in claim 3 with an opening in said housing out of which the conveyor belt passes, and having a steam flow path created within said housing by said nozzles tending to draw air into the latter said opening to produce a flow path out of the former opening thereby circulating air and steam.

5. A system as defined in claim 1 including means driving said conveyor belt through said housing with all mechanisms requiring lubrication mounted in a compartment outside the housing thereby to avoid food contamination.

6. A system as defined in claim 1 wherein the housing is positioned within a secondary housing such as a room where the pressure is maintained above atmospheric.

7. A system as defined in claim 6 including a station for loading food products through which said conveyor belt passes outside said secondary housing so that the food products are maintained at atmospheric pressure until they enter the cooker system whereby the increased pressure and high humidity cause efficient penetration of heat into the products to cook them evenly throughout by establishing a temperature approaching 100° C.

8. A system as defined in claim 1 adapted for processing meat and fowl products which may drip fat into said pool of water, including means continuously skimming the fat from the top of the water to improve the steam capacity thereof.

9. A system as defined in claim 8 wherein the fat skimming means comprises a paddle wheel on one side of the pool generating waves travelling to the other side of the pool and a fat skimmer receiving the crest of the waves and fat residing therein and removing such from the pool of water.

10. A system as defined in claim 8 wherein the heating means for the pool of water comprise heat exchange elements at the bottom of said housing, including means circulating the water over said heat exchange elements to improve the effective steam output efficiency.

11. A system as defined in claim 1 wherein said housing has access doors for entry thereto on all sides.

12. A system as defined in claim 1 wherein the conveyor belt is passed inside said housing in a spiral path coiling downwardly to carry said foods through said housing from an upper to a lower position in said near 100% humidity atmosphere which prevents water dripping downwardly upon the foods being cooked on the belt.

13. A system as defined in claim 1 including means pre-moistening the food products on said conveyor belt before entry into said housing to thereby create an effi-



cient heat interchange surface on the food products for heating by said steam.

14. The system defined in claim 13 wherein the conveyor belt path passes from a loading station at atmospheric pressure into an enclosure above atmospheric

pressure and said moistening means comprises means located within said enclosure producing a fine spray mist covering the surface of the food product on the belt without droplets or steaming.

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Features shown in FIG. 4 include the spiral path 18 taken by the belt 11 through the cooker chamber, access doors 52, etc. for internal access, maintenance and sanitation and the placement of drive means such as chain sprocket 68 for driving the conveyor belt through the spiral path 18 and its associated drive mechanisms. The catwalk array 69 gives a size perspective of the cooker housing 16, and provides access to top entry panels and the mechanism 68 for maintenance. The spiral belt path may have as many convolutions as necessary to retain particular specialty products within the cooking chamber a desired dwell time for the desired belt travel speed.

Details of the heating mechanisms are shown in FIG. 5. For sanitary purposes stainless steel is used wherever possible to avoid any surfaces that could cause dripping or collect contamination. The interior 70 of the housing walls is insulated to preserve heat and to produce a safe and lower temperature outside wall environment around operational personnel.

The steam generator unit 30 could be any standard commercially available steam generator unit and is preferably made of stainless steel. It is coupled to a boiler for a supply of sanitary steam from pure water by means of piping 71. Approved pure water make-up is entered from source 31 to assure sanitary steam. All piping is stainless steel sanitary steam pipe with pipe insulation having sanitary jacketing.

The floor water may be pumped out by pump 75 through drain 76 when sanitizing by detergents from piping 56.

The fat skimmer duct 48 has internal baffling to reduce the loss of hot water and it leads to a settling tank (not shown) for segregation of fats.

The external steam is preferably disposed through piping 78 to the four corners of the cooking chamber and steam is released at nozzles 32', 33' or along the length of the piping such as shown at 79 to provide proper mixture and saturation along the spiral conveyor path with the steam evaporated from the lower water pool.

Externally the cooking cabinet 16 is shown in FIG. 6. The top housing 80 encloses the mechanisms for driving the spiral conveyor system within housing 16 and the top access door 81 permits entry for maintenance, inspection, sanitation and the like.

It is therefore evident that the steam cooking system provided by this invention has advanced the state of the art and provided many improved features. Those novel features believed descriptive of the spirit and nature of the invention are set forth with particularity in the appended claims.

#### INDUSTRIAL APPLICATION

Large volumes of food products are processed on a continuously running conveyor belt passing through an energy efficient steam cooker which preserves product humidity, flavor and appearance. Thus, fish, meat poultry, produce and like food products can be cooked. There are self-cleaning and apparatus features for meeting the strictest of sanitation requirements.

I claim:

1. A food cooking system cooking solely with steam foods such as fish, fowl, meats or produce carried through a cooker on a continuously running conveyor belt, comprising in combination, a cooker housing, means passing said conveyor belt through said housing to expose food products within the cooker housing only

to said steam as the sole cooking medium, and two sources of steam providing said steam to cook the food products, nozzles for releasing steam located inside said housing, one comprising a steam generator supplying supplemental steam into said housing at said nozzles located therein to maintain the atmosphere together with the other steam source at near 100% humidity. 100° C. and a pressure above atmospheric, and the other source of steam comprising a pool of water within said housing with steam means for boiling the water to create steam.

2. The system defined in claim 1 having a steam exhaust pipe, and heat control means for said pool of water regulated as a function of the temperature at said exhaust pipe.

3. The system defined in claim 1 having an opening in said housing into which said conveyor belt passes, and means establishing said steam pressure at a sufficient magnitude to discharge steam at a controlled rate from said housing about the entering conveyor belt.

4. The system defined in claim 3 with an opening in said housing out of which the conveyor belt passes and having a steam flow path created within said housing by said nozzles tending to draw air into the latter said opening to produce a flow path out of the former opening thereby circulating air and steam.

5. A system as defined in claim 1 including means driving said conveyor belt through said housing with all mechanisms requiring lubrication mounted in a compartment outside the housing thereby to avoid food contamination.

6. A system as defined in claim 1 wherein the housing is positioned within a secondary housing such as a room where the pressure is maintained above atmospheric.

7. A system as defined in claim 6 including a station for loading food products through which said conveyor belt passes outside said secondary housing so that the food products are maintained at atmospheric pressure until they enter the cooker system whereby the increased pressure and high humidity cause efficient penetration of heat into the products to cook them evenly throughout by establishing a temperature approaching 100° C.

8. A system as defined in claim 1 adapted for processing meat and fowl products which may drip fat into said pool of water, including means continuously skimming the fat from the top of the water to improve the steam capacity thereof.

9. A system as defined in claim 8 wherein the fat skimming means comprises a paddle wheel on one side of the pool generating waves travelling to the other side of the pool and a fat skimmer receiving the crest of the waves and fat residing therein and removing such from the pool of water.

10. A system as defined in claim 8 wherein the heating means for the pool of water comprise heat exchange elements at the bottom of said housing, including means circulating the water over said heat exchange elements to improve the effective steam output efficiency.

11. A system as defined in claim 1 wherein said housing has access doors for entry thereto on all sides.

12. A system as defined in claim 1 wherein the conveyor belt is passed inside said housing in a spiral path [coiling downwardly to carry said foods through said housing from an upper to a lower position in said near 100% humidity atmosphere which prevents water dripping downwardly upon the foods being cooked on the belt].

13. A system as defined in claim 1 including means pre-moistening the food products on said conveyor belt before entry into said housing to thereby create an efficient heat interchange surface on the food products for heating by said steam.

14. The system defined in claim 13 wherein the conveyor belt path passes from a loading station at atmospheric pressure into an enclosure above atmospheric pressure and said moistening means comprises means located within said enclosure producing a fine spray mist covering the surface of the food product on the belt without droplets or steaming.

15. A self-contained continuous food cooking system comprising:

a cooker housing which establishes an interior space; food-conveyance means for introducing food products into said interior space at an inlet of said cooker housing and for removing the food products from said interior space at an outlet of said cooker housing spaced from said housing inlet;

said food-conveyance means defining a generally spiral path of conveyance for said food products in said interior space, which interior path provides a sufficient dwell time for the food products in said interior space as the food products are substantially continually translated along said defined interior path between said housing inlet and said housing outlet;

said cooker housing including (i) an internal pool of water having a surface at a level below said interior path, and (ii) means in heat-exchange relationship to said pool of water for converting a quantity of water in said pool to steam to thereby provide a steam atmosphere within said interior space which directly contacts said food products to at least in part cook the food products during the translation of the food products along said interior path, whereby at least partially cooked food products exit the cooker housing at said outlet thereof.

16. A cooking system as in claim 15, which further comprises skimmer means for removing a residual film of food-cooking by-products from said pool of water.

17. A cooking system as in claim 16, wherein said skimmer means includes a skimmer adapted to collect the removed food-cooking by-products, and means for creating travelling disturbances on said surface of said pool of water which cause said by-products to move towards said skimmer to be collected thereby.

18. A meat cooking system as in claim 15, wherein:

said food-conveyance means includes an endless conveyor belt for supporting and moving with said food products during their translation along said interior path and which includes a return path exterior of said cooker housing between said outlet and inlet, and wherein the system further comprises means located along said return path exterior of said cooker housing for cleaning food product residue from said endless conveyor before said conveyor reenters said cooker housing inlet.

19. A cooking system as in claim 15 wherein said steam is high humidity steam and said food products are directly exposed to said high humidity steam.

20. A cooking system as in claim 15 wherein said food-conveyance means comprises a moving perforated belt and said food products are stationary with respect to said belt and move with said belt.

21. A cooking system as in claim 15 wherein said housing outlet is vertically spaced from said housing inlet.

22. A cooking system as in claim 15 wherein said interior path includes a plurality of stacked convolutions, the travel of said food products along said stacked convolutions in part providing said sufficient dwell time.

23. A cooking system as in claim 22 wherein a lowermost one of said plural convolutions is above the level of the surface of said pool of water.

24. A food cooking system for cooking food products carried on a moving conveyor belt, comprising:

a cooker housing;

means disposed within said housing for defining a conveyance path,

a conveyor belt disposed along said conveyance path for supporting and conveying said food products along said path,

means coupled to said belt for causing said belt and said food products supported thereby to substantially continually translate along said conveyance path through said housing to expose food products within the housing to steam, said path retaining said translating food products within said housing for at least a desired dwell time, and

a source of steam providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an external steam generator supplying steam into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam.

25. A cooking system as in claim 24 wherein said conveyance path forms a spiral including plural vertically stacked convolutions, the number of said stacked convolutions in part providing said desired dwell time.

26. A cooking system as in claim 24 wherein said steam source provides high humidity steam and said food products are directly exposed to said high humidity steam.

27. A cooking system in claim 24 wherein said conveyor belt comprises a perforated belt that moves with said food products.

28. A cooking system as in claim 24 wherein said source of steam is disposed in a lower portion of said cooker housing.

29. A cooking system as in claim 24 wherein steam within said housing condenses and is reheated and recirculated as steam by said steam source.

30. A cooking system as in claim 24 wherein said translation causing means continually moves said belt.

31. A continuous food cooking system comprising:

a housing;

means for defining an internal conveyance path within said housing,

means disposed along said internal conveyance path for supporting and substantially continually translating food products along said internal path, said food products cooking while within said housing and producing a by-product, said internal path retaining said translating food products within said housing for a dwell time;

internal steam producing means disposed within said housing for producing steam that contacts said food products, said internal steam producing means including:

a water reservoir generally disposed at the bottom of said housing for collecting said by-product, and

a heat exchanger applying heat to said water reservoir to convert some of the water in said reservoir to steam,

said steam contacting said food products translating along said path; and  
means communicating with said water reservoir for facilitating said steam conversion by removing said by-product.

32. A cooking system as in claim 31 wherein said by-product is fat and said facilitating means comprises:  
means for agitating said water reservoir to produce waves on said reservoir surface; and  
skimmer means coupled to said reservoir for skimming said fat by-product from said reservoir surface in response to said waves.

33. A cooking system as in claim 31 wherein:  
said housing includes outlet stack means for exhausting a controlled amount of said steam from said housing, and  
temperature sensing means coupled to said outlet stack means for sensing the temperature of steam exhausted by said outlet stack means; and  
said heat exchanger includes control means for controlling the amount of heat applied thereby to said water reservoir in response to said sensed temperature.

34. A cooking system as in claim 31 wherein said internal conveyance path forms a spiral including a plurality of vertically arranged convolutions.

35. A cooking system as in claim 31 wherein said steam producing means produces high humidity steam and said food products are directly exposed to said high humidity steam.

36. A cooking system as in claim 31 wherein said supporting and translating means comprises a perforated belt that moves with said food products, said food products resting on said belt.

37. A self-contained recirculating continuous steam cooker comprising:  
a housing having a floor and walls enclosing an interior space;

means disposed within said interior space for supporting and substantially continually translating food products along a conveyance path within said housing, said path retaining said translating food products within said housing and permitting said food products to at least partially cook within said housing for a desired dwell time;

internal steam means disposed within said housing for producing steam, said internal steam means including:

a water reservoir disposed on the floor of said housing and having a surface in contact with said interior space, and

heat exchange means for producing steam, said steam contacting and heating said food products and said housing and thereby forming a condensate, said condensate returning to said water reservoir and recirculating.

38. A cooker as in claim 37 further comprising paddle wheel means disposed within said reservoir for agitating said reservoir.

39. A cooker as in claim 37 further comprising:  
means for agitating said water reservoir; and  
means coupled to said reservoir for removing fat by-product from the reservoir surface so as to prevent said fat by-product from inhibiting steam production.

40. A cooker as in claim 37 wherein:  
said housing includes outlet stack means for exhausting a controlled amount of said steam from said housing, and

temperature sensing means coupled to said outlet stack means for sensing the temperature of steam exhausted by said outlet stack means; and  
said heat exchange means includes control means for controlling the amount of heat applied to said water reservoir in response to said sensed temperature.

41. A cooker as in claim 37 wherein said internal steam means produces high humidity steam and said food products are directly exposed to said high humidity steam.

42. A cooker as in claim 37 wherein said supporting and translating means comprises a perforated belt that moves with said food products, said food products resting on said belt.

43. A cooking system for cooking food products such as poultry, said cooking system comprising:  
a housing;

means for defining a conveyance path within said housing, including a belt supporting and substantially continually translating said food products along said path, said path retaining said translating food products within said housing for a desired dwell time such that said food products are heated while within said housing to a desired temperature;

means for providing steam within said housing, said steam contacting said food products and at least in part heating and cooking said food products and causing said food products to produce a fat by-product; means disposed at the floor of said housing for collecting said fat by-product; and

means connected to said collecting means for removing said collected fat by-product from said housing.

44. A system as in claim 43 wherein said collecting means includes:

a pool of water within said housing having a surface at a level below a lowermost convolution of said path; and means for removing fat by-product floating on said surface of said pool of water.

45. A cooking systems in claim 44 wherein said removing means comprises skimmer means for removing a residual film of fat by-products from said pool of water.

46. A cooking system as in claim 45, wherein said skimmer means includes a skimmer adapted to collect the removed fat by-products, and means for creating travelling disturbances which cause said film to move towards said skimmer to be collected thereby.

47. A cooking system as in claim 43 wherein said conveyance path forms a spiral including plural vertically stacked convolutions.

48. A cooking system as in claim 43 wherein said conveyance path is non-linear.

49. A cooking system as in claim 43 wherein said conveyance path is circular.

50. A cooking system as in claim 43 wherein said steam providing means provides high humidity steam and said food products are directly exposed to said high humidity steam.

51. A continuous cooking system for cooking food products such as meat, said cooking system comprising:

a housing comprising thermally insulated walls and at least one access door;

means for defining a conveyance path within said housing;

a conveyor belt disposed along said path for supporting and substantially continually translating food products along said path;

means mechanically coupled to said belt for moving said belt, said path retaining said translating food products within said housing for a desired dwell

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time so as to heat said meat products within said housing to a desired temperature; and steam providing means for providing substantially water droplet free steam within said housing, said steam directly contacting the outer surface of said food products and thereby at least in part heating said food products.

52. A system as in claim 51 further including at least one further heat source means for heating said food products within said housing.

53. A cooking system as in claim 51 wherein said conveyance path includes plural vertically stacked paths.

54. A cooking system as in claim 51 wherein said conveyance path is spiral.

55. A cooking system as in claim 51 wherein said steam providing means provides high humidity steam and said food products are directly exposed to said high humidity steam.

56. A cooking system as in claim 51 wherein said food products rest on said conveyor belt and move with said belt.

57. A continuous steam cooking apparatus for cooking food products such as meat having an outer fat layer, said apparatus comprising:

a housing;

means for defining a conveyance path, said path including an internal conveyance path within said housing and an additional external conveyance path outside said housing, said internal and external paths being connected to at least in part form an endless, continuous path, said internal path retaining said food products translating along said path within said housing for a desired dwell time;

an endless belt disposed along said internal and external paths, said belt adapted for supporting and translating said food products along said paths;

means coupled to said belt for moving said belt along said internal and external paths;

means for providing steam within said housing to come into direct contact with the outer surfaces of said food products supported and translated by said belt so as to at least in part cook said food products; and cleaning means disposed outside said housing and along said external path for cleaning food product residue from said belt.

58. Apparatus as in claim 57 wherein: said steam providing means includes:

a water reservoir disposed on the floor of said housing, said water reservoir defining a surface below said internal path; and

heat exchange means communicating with said water reservoir for producing steam, said steam contacting and heating said food products and said housing and thereby forming a condensate, said condensate returning to said water reservoir and recirculating as steam; and

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said apparatus further includes means for removing said liquid fat by-product from said water reservoir surface so as to prevent said by-product from inhibiting said steam production.

59. An apparatus as in claim 57 wherein said steam providing means provides high humidity steam and said food products are directly exposed to said high humidity steam.

60. An apparatus as in claim 57 wherein said food products rest on and move with said belt.

61. An apparatus as in claim 57 wherein said internal path is spiral.

62. An apparatus as in claim 57 wherein said internal path includes plural vertically stacked convolutions.

63. An apparatus as in claim 57 further including premoistening means disposed along said external path between said cleaning means and said housing for premoistening the surface of said food products supported by said belt before said products enter said housing so as to reduce insulation characteristics of said fat layer disposed on said food products and thereby permit said steam to more rapidly cook said food products.

64. A continuous food cooking system comprising: a housing;

means for defining an internal conveyance path within said housing,

means disposed along said internal conveyance path for supporting and substantially continually translating food products along said internal path, said food products cooking while within said housing and producing a by-product, said path having sufficient convolutions to retain said translating food products within said housing for a desired dwell time; and

a steam source providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an external steam generator supplying steam into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam.

65. A cooker as in claim 64 wherein said steam source comprises internal steam producing means disposed within said housing for producing steam that contacts said food products, said internal steam producing means including: a water reservoir disposed at the bottom of said housing for collecting said by-product, and

heat exchange means for applying heat to said water reservoir to convert some of the water in said reservoir to steam, said steam contacting said food products translating along said internal path.

66. A cooker as in claim 64 wherein said conveyance path is spiral.

67. A cooker as in claim 64 wherein said food products are directly exposed to said steam.

\* \* \* \* \*



Features shown in FIG. 4 include the spiral path 18 taken by the belt 11 through the cooker chamber, access doors 52, etc. for internal access, maintenance and sanitation and the placement of drive means such as chain sprocket 68 for driving the conveyor belt through the spiral path 18 and its associated drive mechanisms. The catwalk array 69 gives a size perspective of the cooker housing 16, and provides access to top entry panels and the mechanism 68 for maintenance. The spiral belt path may have as many convolutions as necessary to retain particular specialty products within the cooking chamber a desired dwell time for the desired belt travel speed.

Details of the heating mechanisms are shown in FIG. 5. For sanitary purposes stainless steel is used wherever possible to avoid any surfaces that could cause dripping or collect contamination. The interior 70 of the housing walls is insulated to preserve heat and to produce a safe and lower temperature outside wall environment around operational personnel.

The steam generator unit 30 could be any standard commercially available steam generator unit and is preferably made of stainless steel. It is coupled to a boiler for a supply of sanitary steam from pure water by means of piping 71. Approved pure water make-up is entered from source 31 to assure sanitary steam. All piping is stainless steel sanitary steam pipe with pipe insulation having sanitary jacketing.

The floor water may be pumped out by pump 75 through drain 76 when sanitizing by detergents from piping 56.

The fat skimmer duct 48 has internal baffling to reduce the loss of hot water and it leads to a settling tank (not shown) for segregation of fats.

The external steam is preferably disposed through piping 78 to the four corners of the cooking chamber and steam is released at nozzles 32', 33' or along the length of the piping such as shown at 79 to provide proper mixture and saturation along the spiral conveyor path with the steam evaporated from the lower water pool.

Externally the cooking cabinet 16 is shown in FIG. 6. The top housing 80 encloses the mechanisms for driving the spiral conveyor system within housing 16 and the top access door 81 permits entry for maintenance, inspection, sanitation and the like.

It is therefore evident that the steam cooking system provided by this invention has advanced the state of the art and provided many improved features. Those novel features believed descriptive of the spirit and nature of the invention are set forth with particularity in the appended claims.

#### INDUSTRIAL APPLICATION

Large volumes of food products are processed on a continuously running conveyor belt passing through an energy efficient steam cooker which preserves product humidity, flavor and appearance. Thus, fish, meat poultry, produce and like food products can be cooked. There are self-cleaning and apparatus features for meeting the strictest of sanitation requirements.

I claim:

1. A food cooking system cooking solely with steam foods such as fish, fowl, meats or produce carried through a cooker on a continuously running conveyor belt, comprising in combination, a cooker housing, means passing said conveyor belt through said housing to expose food products within the cooker housing only

to said steam as the sole cooking medium, and two sources of steam providing said steam to cook the food products, nozzles for releasing steam located inside said housing, one comprising a steam generator supplying supplemental steam into said housing at said nozzles located therein to maintain the atmosphere together with the other steam source at near 100% humidity 100° C. and a pressure above atmospheric, and the other source of steam comprising a pool of water within said housing with steam means for boiling the water to create steam.

2. The system defined in claim 1 having a steam exhaust pipe, and heat control means for said pool of water regulated as a function of the temperature at said exhaust pipe.

3. The system defined in claim 1 having an opening in said housing into which said conveyor belt passes, and means establishing said steam pressure at a sufficient magnitude to discharge steam at a controlled rate from said housing about the entering conveyor belt.

4. The system defined in claim 3 with an opening in said housing out of which the conveyor belt passes and having a steam flow path created within said housing by said nozzles tending to draw air into the latter said opening to produce a flow path out of the former opening thereby circulating air and steam.

5. A system as defined in claim 1 including means driving said conveyor belt through said housing with all mechanisms requiring lubrication mounted in a compartment outside the housing thereby to avoid food contamination.

6. A system as defined in claim 1 wherein the housing is positioned within a secondary housing such as a room where the pressure is maintained above atmospheric.

7. A system as defined in claim 6 including a station for loading food products through which said conveyor belt passes outside said secondary housing so that the food products are maintained at atmospheric pressure until they enter the cooker system whereby the increased pressure and high humidity cause efficient penetration of heat into the products to cook them evenly throughout by establishing a temperature approaching 100° C.

8. A system as defined in claim 1 adapted for processing meat and fowl products which may drip fat into said pool of water, including means continuously skimming the fat from the top of the water to improve the steam capacity thereof.

9. A system as defined in claim 8 wherein the fat skimming means comprises a paddle wheel on one side of the pool generating waves travelling to the other side of the pool and a fat skimmer receiving the crest of the waves and fat residing therein and removing such from the pool of water.

10. A system as defined in claim 8 wherein the heating means for the pool of water comprise heat exchange elements at the bottom of said housing, including means circulating the water over said heat exchange elements to improve the effective steam output efficiency.

11. A system as defined in claim 1 wherein said housing has access doors for entry thereinto on all sides.

12. A system as defined in claim 1 wherein the conveyor belt is passed inside said housing in a spiral path [coiling downwardly to carry said foods through said housing from an upper to a lower position in said near 100% humidity atmosphere which prevents water dripping downwardly upon the foods being cooked on the belt].

13. A system as defined in claim 1 including means pre-moistening the food products on said conveyor belt before entry into said housing to thereby create an efficient heat interchange surface on the food products for heating by said steam.

14. The system defined in claim 13 wherein the conveyor belt path passes from a loading station at atmospheric pressure into an enclosure above atmospheric pressure and said moistening means comprises means located within said enclosure producing a fine spray mist covering the surface of the food product on the belt without droplets or steaming.

15. A self-contained continuous food cooking system comprising:

a cooker housing which establishes an interior space;

food-conveyance means for introducing food products into said interior space at an inlet of said cooker housing and for removing the food products from said interior space at an outlet of said cooker housing spaced from said housing inlet;

said food-conveyance means defining a generally spiral path of conveyance for said food products in said interior space, which interior path provides a sufficient dwell time for the food products in said interior space as the food products are substantially continually translated along said defined interior path between said housing inlet and said housing outlet;

said cooker housing including (i) an internal pool of water having a surface at a level below said interior path, and (ii) means in heat-exchange relationship to said pool of water for converting a quantity of water in said pool to steam to thereby provide a steam atmosphere within said interior space which directly contacts said food products to at least in part cook the food products during the translation of the food products along said interior path, whereby at least partially cooked food products exit the cooker housing at said outlet thereof.

16. A cooking system as in claim 15, which further comprises skimmer means for removing a residual film of food-cooking by-products from said pool of water.

17. A cooking system as in claim 16, wherein said skimmer means includes a skimmer adapted to collect the removed food-cooking by-products, and means for creating travelling disturbances on said surface of said pool of water which cause said by-products to move towards said skimmer to be collected thereby.

18. A meat cooking system as in claim 15, wherein:

said food-conveyance means includes an endless conveyor belt for supporting and moving with said food products during their translation along said interior path and which includes a return path exterior of said cooker housing between said outlet and inlet, and wherein the system further comprises means located along said return path exterior of said cooker housing for cleaning food product residue from said endless conveyor before said conveyor reenters said cooker housing inlet.

19. A cooking system as in claim 15 wherein said steam is high humidity steam and said food products are directly exposed to said high humidity steam.

20. A cooking system as in claim 15 wherein said food-conveyance means comprises a moving perforated belt and said food products are stationary with respect to said belt and move with said belt.

21. A cooking system as in claim 15 wherein said housing outlet is vertically spaced from said housing inlet.

22. A cooking system as in claim 15 wherein said interior path includes a plurality of stacked convolutions, the travel of said food products along said stacked convolutions in part providing said sufficient dwell time.

23. A cooking system as in claim 22 wherein a lowermost one of said plural convolutions is above the level of the surface of said pool of water.

24. A food cooking system for cooking food products carried on a moving conveyor belt, comprising:

a cooker housing;

means disposed within said housing for defining a conveyance path,

a conveyor belt disposed along said conveyance path for supporting and conveying said food products along said path,

means coupled to said belt for causing said belt and said food products supported thereby to substantially continually translate along said conveyance path through said housing to expose food products within the housing to steam, said path retaining said translating food products within said housing for at least a desired dwell time, and

a source of steam providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an external steam generator supplying steam into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam.

25. A cooking system as in claim 24 wherein said conveyance path forms a spiral including plural vertically stacked convolutions, the number of said stacked convolutions in part providing said desired dwell time.

26. A cooking system as in claim 24 wherein said steam source provides high humidity steam and said food products are directly exposed to said high humidity steam.

27. A cooking system in claim 24 wherein said conveyor belt comprises a perforated belt that moves with said food products.

28. A cooking system as in claim 24 wherein said source of steam is disposed in a lower portion of said cooker housing.

29. A cooking system as in claim 24 wherein steam within said housing condenses and is reheated and recirculated as steam by said steam source.

30. A cooking system as in claim 24 wherein said translation causing means continually moves said belt.

31. A continuous food cooking system comprising:

a housing;

means for defining an internal conveyance path within said housing,

means disposed along said internal conveyance path for supporting and substantially continually translating food products along said internal path, said food products cooking while within said housing and producing a by-product, said internal path retaining said translating food products within said housing for a dwell time;

internal steam producing means disposed within said housing for producing steam that contacts said food products, said internal steam producing means including:

a water reservoir generally disposed at the bottom of said housing for collecting said by-product, and

a heat exchanger applying heat to said water reservoir to convert some of the water in said reservoir to steam,

said steam contacting said food products translating along said path; and  
means communicating with said water reservoir for facilitating said steam conversion by removing said by-product.

32. A cooking system as in claim 31 wherein said by-product is fat and said facilitating means comprises:

means for agitating said water reservoir to produce waves on said reservoir surface; and

skimmer means coupled to said reservoir for skimming said fat by-product from said reservoir surface in response to said waves.

33. A cooking system as in claim 31 wherein:

said housing includes outlet stack means for exhausting a controlled amount of said steam from said housing, and

temperature sensing means coupled to said outlet stack means for sensing the temperature of steam exhausted by said outlet stack means; and

said heat exchanger includes control means for controlling the amount of heat applied thereby to said water reservoir in response to said sensed temperature.

34. A cooking system as in claim 31 wherein said internal conveyance path forms a spiral including a plurality of vertically arranged convolutions.

35. A cooking system as in claim 31 wherein said steam producing means produces high humidity steam and said food products are directly exposed to said high humidity steam.

36. A cooking system as in claim 31 wherein said supporting and translating means comprises a perforated belt that moves with said food products, said food products resting on said belt.

37. A self-contained recirculating continuous steam cooker comprising:

a housing having a floor and walls enclosing an interior space;

means disposed within said interior space for supporting and substantially continually translating food products along a conveyance path within said housing, said path retaining said translating food products within said housing and permitting said food products to at least partially cook within said housing for a desired dwell time;

internal steam means disposed within said housing for producing steam, said internal steam means including:

a water reservoir disposed on the floor of said housing and having a surface in contact with said interior space, and

heat exchange means for producing steam, said steam contacting and heating said food products and said housing and thereby forming a condensate, said condensate returning to said water reservoir and recirculating.

38. A cooker as in claim 37 further comprising paddle wheel means disposed within said reservoir for agitating said reservoir.

39. A cooker as in claim 37 further comprising:

means for agitating said water reservoir; and  
means coupled to said reservoir for removing fat by-product from the reservoir surface so as to prevent said fat by-product from inhibiting steam production.

40. A cooker as in claim 37 wherein:

said housing includes outlet stack means for exhausting a controlled amount of said steam from said housing, and

temperature sensing means coupled to said outlet stack means for sensing the temperature of steam exhausted by said outlet stack means; and

said heat exchange means includes control means for controlling the amount of heat applied to said water reservoir in response to said sensed temperature.

41. A cooker as in claim 37 wherein said internal steam means produces high humidity steam and said food products are directly exposed to said high humidity steam.

42. A cooker as in claim 37 wherein said supporting and translating means comprises a perforated belt that moves with said food products, said food products resting on said belt.

43. A cooking system for cooking food products such as poultry, said cooking system comprising:

a housing;

means for defining a conveyance path within said housing, including a belt supporting and substantially continually translating said food products along said path, said path retaining said translating food products within said housing for a desired dwell time such that said food products are heated while within said housing to a desired temperature;

means for providing steam within said housing, said steam contacting said food products and at least in part heating and cooking said food products and causing said food products to produce a fat by-product; means disposed at the floor of said housing for collecting said fat by-product; and

means connected to said collecting means for removing said collected fat by-product from said housing.

44. A system as in claim 43 wherein said collecting means includes:

a pool of water within said housing having a surface at a level below a lowermost convolution of said path; and means for removing fat by-product floating on said surface of said pool of water.

45. A cooking systems in claim 44 wherein said removing means comprises skimmer means for removing a residual film of fat by-products from said pool of water.

46. A cooking system as in claim 45, wherein said skimmer means includes a skimmer adapted to collect the removed fat by-products, and means for creating travelling disturbances which cause said film to move towards said skimmer to be collected thereby.

47. A cooking system as in claim 43 wherein said conveyance path forms a spiral including plural vertically stacked convolutions.

48. A cooking system as in claim 43 wherein said conveyance path is non-linear.

49. A cooking system as in claim 43 wherein said conveyance path is circular.

50. A cooking system as in claim 43 wherein said steam providing means provides high humidity steam and said food products are directly exposed to said high humidity steam.

51. A continuous cooking system for cooking food products such as meat, said cooking system comprising:

a housing comprising thermally insulated walls and at least one access door;

means for defining a conveyance path within said housing;

a conveyor belt disposed along said path for supporting and substantially continually translating food products along said path;

means mechanically coupled to said belt for moving said belt, said path retaining said translating food products within said housing for a desired dwell

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time so as to heat said meat products within said housing to a desired temperature; and steam providing means for providing substantially water droplet free steam within said housing, said steam directly contacting the outer surface of said food products and thereby at least in part heating said food products.

52. A system as in claim 51 further including at least one further heat source means for heating said food products within said housing.

53. A cooking system as in claim 51 wherein said conveyance path includes plural vertically stacked paths.

54. A cooking system as in claim 51 wherein said conveyance path is spiral.

55. A cooking system as in claim 51 wherein said steam providing means provides high humidity steam and said food products are directly exposed to said high humidity steam.

56. A cooking system as in claim 51 wherein said food products rest on said conveyor belt and move with said belt.

57. A continuous steam cooking apparatus for cooking food products such as meat having an outer fat layer, said apparatus comprising:

a housing;

means for defining a conveyance path, said path including an internal conveyance path within said housing and an additional external conveyance path outside said housing, said internal and external paths being connected to at least in part form an endless, continuous path, said internal path retaining said food products translating along said path within said housing for a desired dwell time;

an endless belt disposed along said internal and external paths, said belt adapted for supporting and translating said food products along said paths;

means coupled to said belt for moving said belt along said internal and external paths;

means for providing steam within said housing to come into direct contact with the outer surfaces of said food products supported and translated by said belt so as to at least in part cook said food products; and cleaning means disposed outside said housing and along said external path for cleaning food product residue from said belt.

58. Apparatus as in claim 57 wherein: said steam providing means includes:

a water reservoir disposed on the floor of said housing, said water reservoir defining a surface below said internal path; and

heat exchange means communicating with said water reservoir for producing steam, said steam contacting and heating said food products and said housing and thereby forming a condensate, said condensate returning to said water reservoir and recirculating as steam; and

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said apparatus further includes means for removing said liquid fat by-product from said water reservoir surface so as to prevent said by-product from inhibiting said steam production.

59. An apparatus as in claim 57 wherein said steam providing means provides high humidity steam and said food products are directly exposed to said high humidity steam.

60. An apparatus as in claim 57 wherein said food products rest on and move with said belt.

61. An apparatus as in claim 57 wherein said internal path is spiral.

62. An apparatus as in claim 57 wherein said internal path includes plural vertically stacked convolutions.

63. An apparatus as in claim 57 further including premoistening means disposed along said external path between said cleaning means and said housing for premoistening the surface of said food products supported by said belt before said products enter said housing so as to reduce insulation characteristics of said fat layer disposed on said food products and thereby permit said steam to more rapidly cook said food products.

64. A continuous food cooking system comprising: a housing;

means for defining an internal conveyance path within said housing,

means disposed along said internal conveyance path for supporting and substantially continually translating food products along said internal path, said food products cooking while within said housing and producing a by-product, said path having sufficient convolutions to retain said translating food products within said housing for a desired dwell time; and

a steam source providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an external steam generator supplying steam into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam.

65. A cooker as in claim 64 wherein said steam source comprises internal steam producing means disposed within said housing for producing steam that contacts said food products, said internal steam producing means including: a water reservoir disposed at the bottom of said housing for collecting said by-product, and

heat exchange means for applying heat to said water reservoir to convert some of the water in said reservoir to steam, said steam contacting said food products translating along said internal path.

66. A cooker as in claim 64 wherein said conveyance path is spiral.

67. A cooker as in claim 64 wherein said food products are directly exposed to said steam.

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driving the conveyor belt through the spiral path 18 and its associated drive mechanisms. The catwalk array 69 gives a size perspective of the cooker housing 16, and provides access to top entry panels and the mechanism 68 for maintenance. The spiral belt path may have as many convolutions as necessary to retain particular specialty products within the cooking chamber a desired dwell time for the desired belt travel speed.

Details of the heating mechanisms are shown in FIG. 5. For sanitary purposes stainless steel is used wherever possible and the interior walls of the housing 16 are smooth to avoid any surfaces that could cause dripping or collect contamination. The interior 70 of the housing walls is insulated to preserve heat and to produce a safe and lower temperature outside wall environment around operational personnel.

The steam generator unit 30 could be any standard commercially available steam generator unit and is preferably made of stainless steel. It is coupled to a boiler for a supply of sanitary steam from pure water by means of piping 71. Approved pure water make-up is entered from source 31 to assure sanitary steam. All piping is stainless steel sanitary steam pipe with pipe insulation having sanitary jacketing.

The floor water may be pumped out by pump 75 through drain 76 when sanitizing by detergents from piping 56.

The fat skimmer duct 48 has internal baffling to reduce the loss of hot water and it leads to a settling tank (not shown) for segregation of fats.

The external steam is preferably disposed through piping 78 to the four corners of the cooking chamber and steam is released at nozzles 32', 33' or along the length of the piping such as shown at 79 to provide proper mixture and saturation along the spiral conveyor path with the steam evaporated from the lower water pool.

Externally the cooking cabinet 16 is shown in FIG. 6. The top housing 80 encloses the mechanisms for driving the spiral conveyor system within housing 16 and the top access door 81 permits entry for maintenance, inspection, sanitation and the like.

It is therefore evident that the steam cooking system provided by this invention has advanced the state of the art and provided many improved features. Those novel features believed descriptive of the spirit and nature of the invention are set forth with particularity in the appended claims.

#### INDUSTRIAL APPLICATION

Large volumes of food products are processed on a continuously running conveyor belt passing through an energy efficient steam cooker which preserves product humidity, flavor and appearance. Thus, fish, meat, poultry, produce and like food products can be cooked. There are self-cleaning and apparatus features for meeting the strictest of sanitation requirements.

I claim:

[1. A food cooking system cooking solely with steam foods such as fish, fowl, meats or produce carried through a cooker on a continuously running conveyor belt, comprising in combination, a cooker housing, means passing said conveyor belt through said housing to expose food products within the cooker housing only to said steam as the sole cooking medium, and two sources of steam providing said steam to cook the food products, nozzles for releasing steam located inside said housing, one comprising a steam generator supplying supplemental steam into said housing at said nozzles located therein to maintain the atmosphere

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together with the other steam source at near 100% humidity 100° C. and a pressure above atmospheric, and the other source of steam comprising a pool of water within said housing with heating means for boiling the water to create steam.]

[2. The system defined in claim 1 having a steam exhaust pipe, and heat control means for said pool of water regulated as a function of the temperature at said exhaust pipe.]

[3. The system defined in claim 1 having an opening in said housing into which said conveyor belt passes, and means establishing said steam pressure at a sufficient magnitude to discharge steam at a controlled rate from said housing about the entering conveyor belt.]

[4. The system defined in claim 3 with an opening in said housing out of which the conveyor belt passes, and having a steam flow path created within said housing by said nozzles tending to draw air into the latter said opening to produce a flow path out of the former opening thereby circulating air and steam.]

[5. A system as defined in claim 1 including means driving said conveyor belt through said housing with all mechanisms requiring lubrication mounted in a compartment outside the housing thereby to avoid food contamination.]

[6. A system as defined in claim 1 wherein the housing is positioned within a secondary housing such as a room where the pressure is maintained above atmospheric.]

[7. A system as defined in claim 6 including a station for loading food products through which said conveyor belt passes outside said secondary housing so that the food products are maintained at atmospheric pressure until they enter the cooker system whereby the increased pressure and high humidity cause efficient penetration of heat into the products to cook them evenly throughout by establishing a temperature approaching 100° C.]

[8. A system as defined in claim 1 adapted for processing meat and fowl products which may drip fat into said pool of water, including means continuously skimming the fat from the top of the water to improve the steam capacity thereof.]

[9. A system as defined in claim 8 wherein the fat skimming means comprises a paddle wheel on one side of the pool generating waves travelling to the other side of the pool and a fat skimmer receiving the crest of the waves and fat residing therein and removing such from the pool of water.]

[10. A system as defined in claim 8 wherein the heating means for the pool of water comprise heat exchange elements at the bottom of said housing, including means circulating the water over said heat exchange elements to improve the effective steam output efficiency.]

[11. A system as defined in claim 1 wherein said housing has access doors for entry thereto on all sides.]

[12. A system as defined in claim 1 wherein the conveyor belt is passed inside said housing in a spiral path coiling downwardly to carry said foods through said housing from an upper to a lower position in said near 100% humidity atmosphere which prevents water dripping downwardly upon the foods being cooked on the belt.]

[13. A system as defined in claim 1 including means pre-moistening the food products on said conveyor belt before entry into said housing to thereby create an efficient heat interchange surface on the food products for heating by said steam.]

[14. The system defined in claim 13 wherein the conveyor belt path passes from a loading station at atmospheric pressure into an enclosure above atmospheric pressure and said moistening means comprises means located within said enclosure producing a fine spray mist covering the surface of the food product on the belt without droplets or steaming.]



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[15. A self-contained continuous meat cooking system comprising:

a cooker housing which establishes an interior space; meat-conveyance means for introducing meat into said interior space at an inlet of said cooker housing and for removing the meat from said interior space at an outlet of said cooker housing vertically spaced from said housing inlet;

said meat-conveyance means, defining a spiral path of conveyance for said meat in said interior space, which spiral path includes a predetermined number of convolutions so as to establish a sufficient dwell time for the meat in said interior space as the meat is continually translated along said defined path between said housing inlet and said housing outlet;

said cooker housing including (i) an internal pool of water having a surface level below a lowermost one of said convolutions of said meat-conveyance means, and (ii) means in heat-exchange relationship to said pool of water for converting a quantity of water in said pool to steam which is contained within said interior space of said housing to thereby provide a steam atmosphere within said interior space to at least in part cook the meat during the continual translation of the meat along said spiral path, whereby cooked meat exits the cooker housing at said outlet thereof.]

[16. A meat cooking system as in claim 15, which further comprises skimmer means for continually removing a residual floating film of meat-cooking by-products from said surface level of said pool of water.]

[17. A meat cooking system as in claim 16, wherein said skimmer means includes a skimmer adapted to collect the removed meat-cooking by-products, and means for creating travelling disturbances on said surface level of said pool of water which cause said floating film to move towards said skimmer to be collected thereby.]

[18. A meat cooking system as in claim 15, wherein, said meat-conveyance means includes an endless conveyor for supporting said meat during its continual translation along said spiral path and which includes a return path exterior of said cooker housing between said outlet and inlet, and wherein the system further comprises

means located along said return path exterior of said cooker housing for cleaning said endless conveyor before it reenters said cooker housing inlet.]

[19. A system for at least partially cooking substantially uncovered food products such as poultry parts, said cooking being performed at least in part with steam, said system comprising:

a housing defining an internal volume having a spiral conveyance path therein,

a conveyor belt disposed along said spiral conveyance path, said conveyor belt adapted for supporting and carrying said uncovered food products through said internal volume,

a belt drive mechanism coupled to said conveyor belt, said belt drive mechanism driving said conveyor belt to continually translate said belt along said spiral conveyance path through said housing to expose said supported and carried uncovered food products to a high humidity steam atmosphere,

a steam source operatively coupled to said housing, said steam source providing said high humidity steam atmosphere within said internal volume, said steam atmo-

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sphere directly contacting and at least partially cooking the uncovered food products, and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

20. A cooking system for cooking food products such as poultry, said cooking system comprising:

a housing including thermally insulated walls, said housing defining a spiral conveyance path therein;

a conveyor belt defining an open grating, said belt being disposed along said path, said conveyor belt adapted for supporting exposed food products;

a drive mechanism mechanically coupled to said belt, said drive mechanism moving said belt and said exposed food products supported thereon along said spiral path, said path having sufficient convolutions to retain said translating food products within said housing for a desired dwell time so as to heat said poultry products within said housing to a desired temperature;

a steam source coupled to said housing, said steam source providing a high humidity steam atmosphere within said housing, said high humidity steam atmosphere directly contacting outer surfaces of said exposed food products so as to at least in part heat and cook said food products; and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

21. A cooking apparatus adapted for cooking food products such as poultry parts having an outer fat layer, said apparatus comprising:

a housing defining a spiral conveyance path therein;

an endless belt at least partially disposed along said spiral path, said belt adapted for supporting and continually translating exposed food products along said spiral conveyance path; and

a steam source providing high humidity steam within said housing in direct contact with the outer surfaces of said exposed food products supported and translated by said belt so as to at least in part cook said food products while said food products are within said housing;

an arrangement coupled to said housing which continually removes fat byproducts from said housing while said food products are cooking within said housing; and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

22. A meat cooking apparatus as in claim 21 further including an automatic cleaning arrangement disposed outside said housing and in proximity to a portion of said belt, said cleaning arrangement continually cleaning said belt.

23. A cooking apparatus adapted for cooking food products such as poultry parts having an outer fat layer, said apparatus comprising:

a housing defining a spiral conveyance path therein;

an endless belt at least partially disposed along said spiral path, said belt adapted for supporting and continually translating exposed food products along said spiral conveyance path;

a steam source providing high humidity steam within said housing in direct contact with the outer surfaces of said

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exposed food products supported and translated by said belt so as to at least in part cook said food products while said food products are within said housing; and

an arrangement coupled to said housing which continually removes fat byproducts from said housing while said food products are cooking within said housing, said cooking apparatus further including a premoistening arrangement disposed in proximity to a loading portion of said belt, said premoistening arrangement premoistening surfaces of said exposed food products supported by said belt before said food products enter said housing so as to reduce insulation characteristics of said fat layer to thereby facilitate more rapid cooking of said food products by said steam.

24. A spiral steam cooker for at least partially cooking exposed food products in a high humidity steam atmosphere, said cooker comprising:

a housing defining an internal volume therein;

an endless conveyor belt at least partially disposed along a spiral conveyance path within said internal volume, said conveyor belt adapted for supporting and carrying said food products in an exposed manner through said internal volume;

a belt drive mechanism coupled to said conveyor belt, said belt drive mechanism driving said conveyor belt to continually translate along said spiral conveyance path,

a steam source providing said high humidity steam atmosphere within said internal volume, said high humidity steam atmosphere directly contacting and at least partially cooking the exposed food products, and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

25. A spiral steam cooker for heating and at least partially cooking exposed food products, said cooker comprising:

a housing defining an internal volume therein;

an endless conveyor belt at least partially disposed along a spiral conveyance path within said internal volume, said conveyor belt for, in use, supporting and carrying said exposed food products through said internal volume, said conveyor belt being adapted to continually translate along said spiral conveyance path through said housing,

a steam source disposed within said housing, said steam source providing a steam atmosphere within said internal volume, said steam atmosphere directly contacting and at least partially cooking the exposed food products, and

at least one additional source of heat introducing heat into said housing.

26. A cooker as in claim 25 further including means for continually removing liquified fat from said housing.

27. A cooker as in claim 25 wherein said steam source includes a heated pool of water disposed at the bottom of said housing.

28. A spiral steam cooker for at least partially cooking exposed food products, said cooker comprising:

a housing defining an internal volume therein;

a conveyor belt at least partially disposed along a spiral conveyance path within said internal volume, said conveyor belt for, in use, supporting and carrying said exposed food products through said internal volume,

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said conveyor belt adapted to continually translate along said spiral conveyance path through said housing; and

a steam source operatively coupled to said housing, said steam source providing a high humidity steam atmosphere within said internal volume, said high humidity steam atmosphere directly contacting and at least partially cooking the exposed food products, said steam source including at least one steam pipe for injecting steam into said housing and for substantially filling said housing with said high humidity steam atmosphere.

29. A food cooking system for cooking food products with steam as said food products are supported on a moving conveyor belt, said food cooking system comprising:

a cooker housing,

means disposed within said housing for defining a conveyance path,

a conveyor belt disposed along said conveyance path for supporting and carrying said food products along said path,

means coupled to said belt for causing said belt and said food products supported thereby to substantially continually translate along said conveyance path through said housing to expose food products within the housing to steam, said path retaining said translating food products within said housing for at least a desired dwell time, and

a source of steam providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an external steam generator supplying steam into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam,

wherein said steam source provides high humidity steam and said food products are directly exposed to said high humidity steam.

30. A food cooking system for cooking food products with steam as said food products rest on a moving conveyor belt, said food cooking system comprising:

a cooker housing,

means disposed within said housing for defining a conveyance path,

a conveyor belt disposed along said conveyance path for supporting and conveying said food products along said path,

means coupled to said belt for causing said belt and said food products supported thereby to substantially continually translate along said conveyance path through said housing to expose food products within the housing to steam, said path retaining said translating food products within said housing for at least a desired dwell time, and

a source of steam providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an external steam generator supplying into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam,

wherein steam within said housing condenses into a condensate and said steam source recirculates at least some of said condensate as steam.

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31. A continuous food cooking system for cooking food products with steam, said food cooking system comprising: a housing;

means for defining an internal conveyance path within said housing;

means disposed along said internal conveyance path for supporting and substantially continually translating food products along said internal path, said food products cooking while within said housing and producing a by-product, said path having sufficient convolutions to retain said translating food products within said housing for a desired dwell time; and

a steam source providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an internal steam generator supplying steam into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam,

wherein said steam source provides high humidity steam and said food products are directly exposed to said high humidity steam.

32. A continuous food cooking system for heating and at least partially cooking food products with steam, said continuous food cooking system comprising:

a housing;

a belt disposed along an internal spiral conveyance path within said housing, said belt, in use, supporting said food products such that said food products rest directly upon an upper surface of said belt, said belt substantially continually translating along said conveyance path within said housing so as to heat and at least partially cook said food products while said food products are within said housing;

a steam providing arrangement disposed, at least in part, within said housing for providing steam within said housing, said steam providing arrangement providing a high humidity steam atmosphere within said housing, said high humidity steam atmosphere which contacts, heats, and at least partially cooks said food products as said food products translate along said path;

a by-product removing arrangement for continually removing, from said housing, by-products such as fat released by said cooking food products; and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

33. A system as in claim 32 wherein said by-product removing arrangement is located at least partially within said housing.

34. A system as in claim 32 wherein said steam providing arrangement provides said high humidity steam atmosphere at near 100% humidity.

35. A system as in claim 32 wherein said by-product removing arrangement prevents fat released by said cooking food products from being broken down into a residue gas which would adversely flavor the food products.

36. A system as in claim 32 wherein said by-product removing arrangement cooperates with said housing to substantially prevent fat released by said cooking food products from forming a scum within said housing that is not easily removable from said housing.

37. A system as in claim 32 wherein said housing has first and second walls, and said system includes at least one access door in each of said first and second walls.

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38. A system as in claim 32 wherein said system further includes a spray wash unit, wherein said belt passes through said spray wash unit so as to clean said belt.

39. A system as in claim 38 wherein said belt cleaning is performed on a substantially continuous basis.

40. A system as in claim 38 wherein said spray wash unit includes at least one spray nozzle which generates a liquid spray, and said belt has an open grating upon which the products rest, said open grating permitting said liquid spray to flow through said belt.

41. A system as in claim 38 wherein said spray wash unit includes a continually running motor-pump which continually recirculates at least a portion of said liquid spray through said spray wash unit.

42. A system as in claim 41 wherein said spray wash unit further includes a filter for filtering at least a portion of said liquid spray prior to recirculating.

43. A system as in claim 38 wherein said spray wash unit includes a sump for holding said liquid spray and permitting recirculation thereof.

44. A system as in claim 38 wherein said spray wash unit is adapted to spray a detergent spray solution.

45. A system as in claim 38 wherein said spray wash unit includes sufficient spray nozzles and provides sufficient spray pressure to as to dislodge crumbs and/or drippings remaining on the belt after said food products are unloaded from the belt.

46. A system as in claim 32 further including an outlet stack which lets steam flow out of said housing in a controlled amount.

47. A system as in claim 32 wherein convolutions of said belt disposed within said housing are not lubricated.

48. A system as in claim 32 further including a fan coupled to said housing for creating a flow of high humidity steam within said housing.

49. A system as in claim 32 further including a fan coupled to said housing for creating a gas flow which is counter to the direction of travel of said belt.

50. A system as in claim 32 wherein said belt is wide enough to support several side-by-side pieces of meat, produce, fish or poultry.

51. A system as in claim 42 wherein said system has a throughput capacity of in excess of a ton of food product per hour.

52. A system as in claim 32 wherein said system is capable of providing a dwell time of at least twenty minutes.

53. A system as in claim 32 wherein said system is capable of heating said food products to a temperature of at least 97 degrees centigrade.

54. A system as in claim 32 wherein said internal cleaning spray arrangement includes a spray pipe not used by said steam providing arrangement.

55. A system as in claim 32 wherein said steam providing arrangement provides a constant circulating flow of high humidity steam about the products being carried on said belt.

56. A system as in claim 32 wherein said steam providing arrangement includes means for flowing steam in a direction counter to the direction of translation of said belt to create a circulation path.

57. A system as in claim 32 wherein said steam providing arrangement creates a circulation of steam within said housing.

58. A system as in claim 32 further including a circulation fan for introducing a desired ratio of outside air into the housing for circulation.

59. A system as in claim 32 wherein a portion of said belt is disposed along a path outside of said housing, and a belt

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cleaning system continually cleans said portion of said belt outside of said housing.

60. A system as in claim 32 further including an arrangement for recovering said removed by-products so as to permit said by-products to be useable.

61. A system as in claim 32 wherein said housing has at least one opening through which said belt travels, and said system further includes means for resisting the flow of hot air or steam out of said housing.

62. A system as in claim 32 wherein said by-product removing arrangement prevents any accumulation of fat film on a surface near the bottom of said housing.

63. A system as in claim 32 wherein said by-product removing arrangement includes a means outside of said housing for segregating fats from said by-product.

64. A system as in claim 32 further including a belt drive mechanism disposed outside of said housing, said belt drive mechanism causing said belt to translate.

65. A system as in claim 32 wherein said belt path has as many convolutions as necessary to retain particular specialty products within the housing for a desired dwell time and belt travel speed.

66. A system as in claim 32 wherein said housing walls are insulated to preserve heat and to produce a safe and lower temperature outside wall environment.

67. A system as in claim 32 wherein said steam providing arrangement includes a steam generator unit external to said housing.

68. A system as in claim 67 wherein said steam providing arrangement has components made of stainless steel.

69. A system as in claim 67 wherein said steam providing arrangement is adapted to be coupled to a boiler.

70. A system as in claim 67 wherein said steam providing arrangement is adapted to be supplied with sanitary steam, and includes a stainless steel sanitary steam pipe with pipe insulation having sanitary jacketing.

71. A system as in claim 32 wherein said housing has a floor with a drain therein.

72. A continuous food cooking system for heating and at least partially cooking food products with steam, said continuous food cooking system comprising:

a housing;

a belt disposed along an internal spiral conveyance path within said housing, said belt, in use, supporting said food products such that said food products rest directly upon an upper surface of said belt, said belt substantially continually translating along said conveyance path within said housing so as to heat and at least partially cook said food products while said food products are within said housing;

a steam providing arrangement disposed, at least in part, within said housing for providing steam within said housing, said steam providing arrangement providing a high humidity steam atmosphere within said housing, said high humidity steam atmosphere which contacts, heats and at least partially cooks said food products as said food products translate along said path; and

a by-product removing arrangement for continually removing, from said housing, by-products such as fat released by said cooking food products,

said system further including:

a gas discharge stack for discharging steam from said housing; and

a temperature sensor coupled to said gas discharge stack, said temperature sensor sensing the temperature of the steam discharged by said gas discharge stack.

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73. A system as in claim 72 wherein said steam providing arrangement is responsive to said sensed temperature.

74. A system as in claim 72 wherein said steam providing arrangement provides an amount of steam responsive to the temperature sensed by said temperature sensor.

75. A continuous food cooking system for heating and at least partially cooking food products with steam, said continuous food cooking system comprising:

a housing;

a belt disposed along an internal spiral conveyance path within said housing, said belt, in use, supporting said food products such that said food products rest directly upon an upper surface of said belt, said belt substantially continually translating along said conveyance path within said housing so as to heat and at least partially cook said food products while said food products are within said housing;

a steam providing arrangement disposed, at least in part, within said housing for providing steam within said housing, said steam providing arrangement providing a high humidity steam atmosphere within said housing, said high humidity steam atmosphere which contacts, heats and at least partially cooks said food products as said food products translate along said path; and

a by-product removing arrangement for continually removing, from said housing, by-products such as fat released by said cooking food products,

said system further including a heat source in addition to said steam providing means, said additional heat source introducing additional heat into said housing for heating and at least in part cooking said food products.

76. A continuous food cooking system for heating and at least partially cooking food products with steam, said continuous food cooking system comprising:

a housing;

a belt disposed along an internal spiral conveyance path within said housing, said belt, in use, supporting said food products such that said food products rest directly upon an upper surface of said belt, said belt having an open grating which permits steam and liquid to flow through said belt, said belt substantially continually translating along said conveyance path within said housing so as to at least partially cook said food products while said food products are within said housing;

a steam providing arrangement disposed within said housing for providing steam within said housing, said steam providing arrangement providing a high humidity steam atmosphere within said housing, said high humidity steam atmosphere contacting and at least partially cooking said food products as said food products translate along said path; and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

77. A system as in claim 76 wherein:

said housing further includes a floor with a drain; and said system further includes means for selectively permitting said sanitizing solution to exit said housing through said drain.

\* \* \* \* \*

# United States Patent [19]

Williams

[11] Patent Number: 4,582,047

[45] Date of Patent: Apr. 15, 1986

[54] HIGH HUMIDITY STEAM COOKER WITH CONTINUOUSLY RUNNING CONVEYOR

[75] Inventor: Charles E. Williams, Moorefield, W. Va.

[73] Assignee: Hester Industries, Inc., Moorefield, W. Va.

[21] Appl. No.: 60,986

[22] Filed: Jul. 26, 1979

[51] Int. Cl.<sup>4</sup> ..... A23L 3/06

[52] U.S. Cl. .... 126/369; 99/443 C

[58] Field of Search ..... 99/352, 339, 362, 366, 99/370-404, 425-443 C, 467, 473, 475, 477; 62/264, 265, 412; 15/256.5; 98/36; 126/273 R; 198/229, 482, 494, 778; 210/DIG. 25, 242, 540; 426/510, 511; 432/64, 65, 242

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Primary Examiner—Philip R. Coe

Assistant Examiner—Frankie L. Stinson

Attorney, Agent, or Firm—Laurence R. Brown

## [57] ABSTRACT

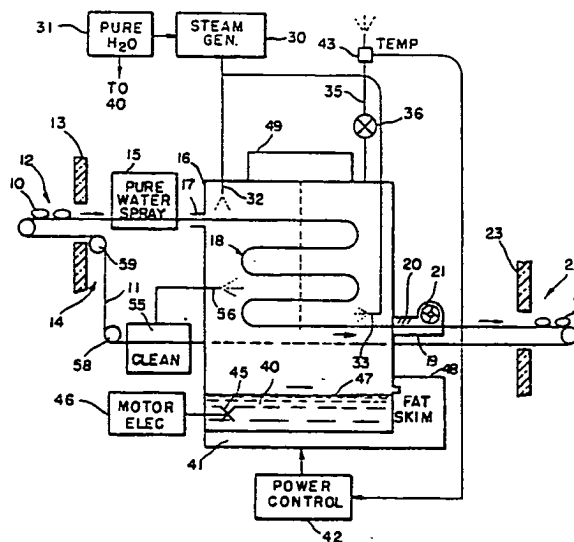
A steam cooker processes large quantities of food products such as meat, fish, poultry and produce passed therethrough in a spiral conveyor path. The continuously running conveyor is provided with loading and unloading stations outside the cooker and with a continuously operable spray detergent cleaning bath.

Efficient cooking is achieved without loss of humidity, flavor or appearance by maintaining water drop free steam at near 100° C. and 100% humidity at a pressure greater than atmospheric and by features of the apparatus including control of steam flow out of the cooking chamber and introduction of cold air therinto.

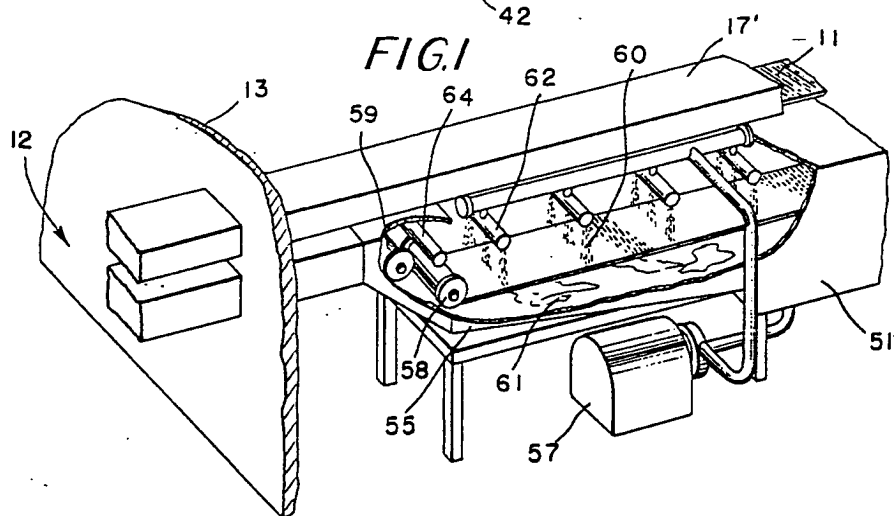
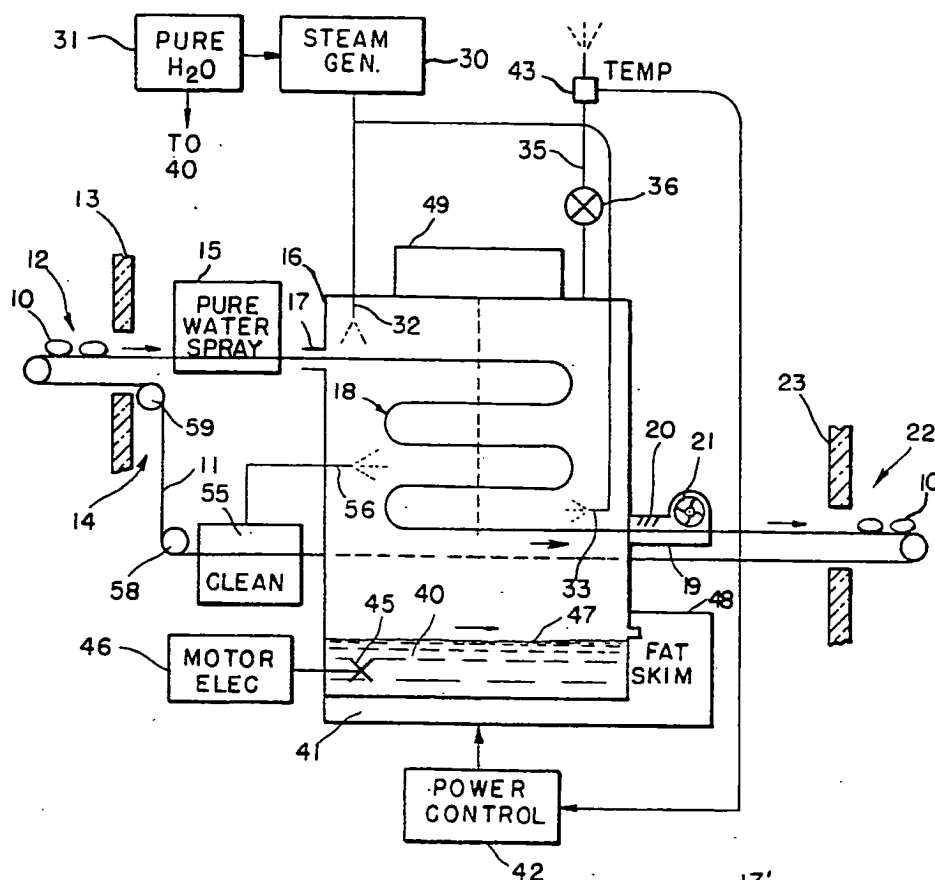
Two separate steam sources, internal and external, are provided with the internal source comprising a heated pool of water on the floor of the cooker chamber, which is agitated for heat transfer efficiency and to remove fat or drippings from the cooking products.

Sanitation means include mounting of machinery parts outside the cooker, access to all sides of the cooking chamber for cleaning, an internal cleaning spray system and other apparatus features.

14 Claims, 6 Drawing Figures







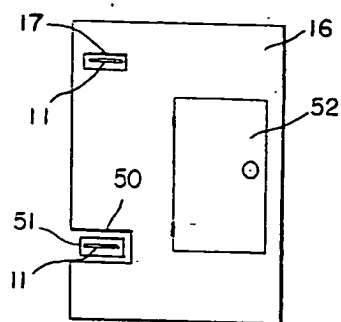


FIG. 2

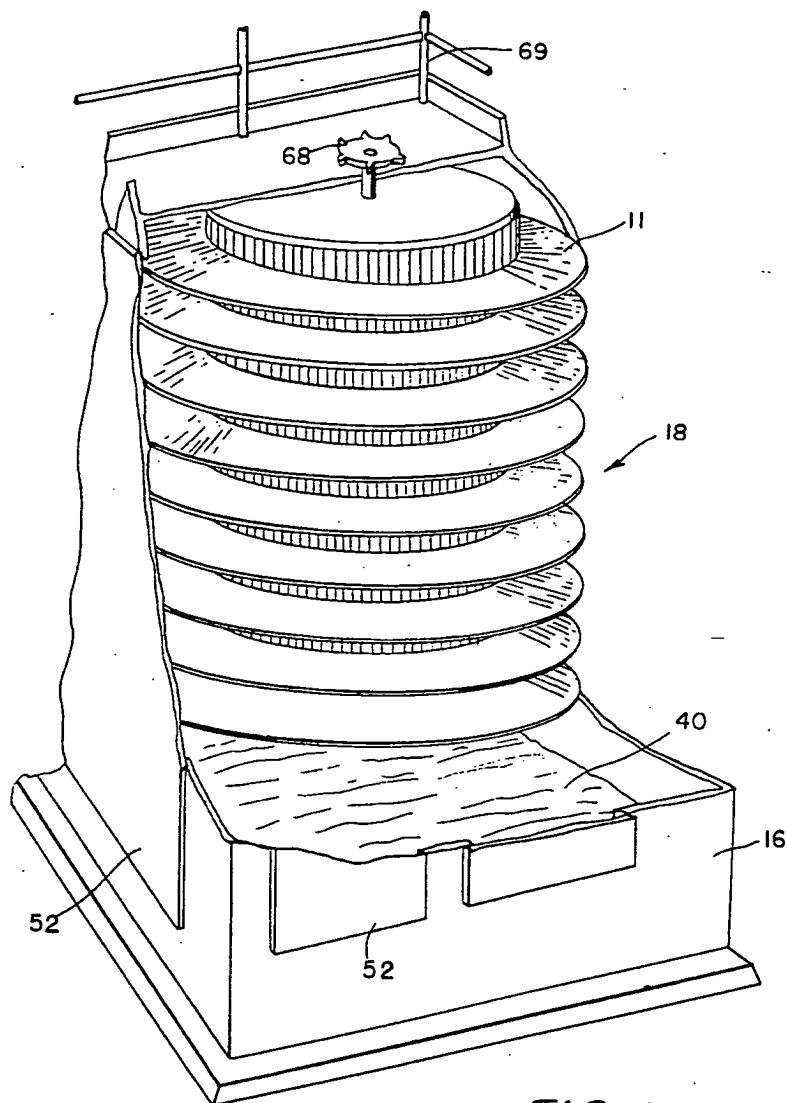


FIG. 4



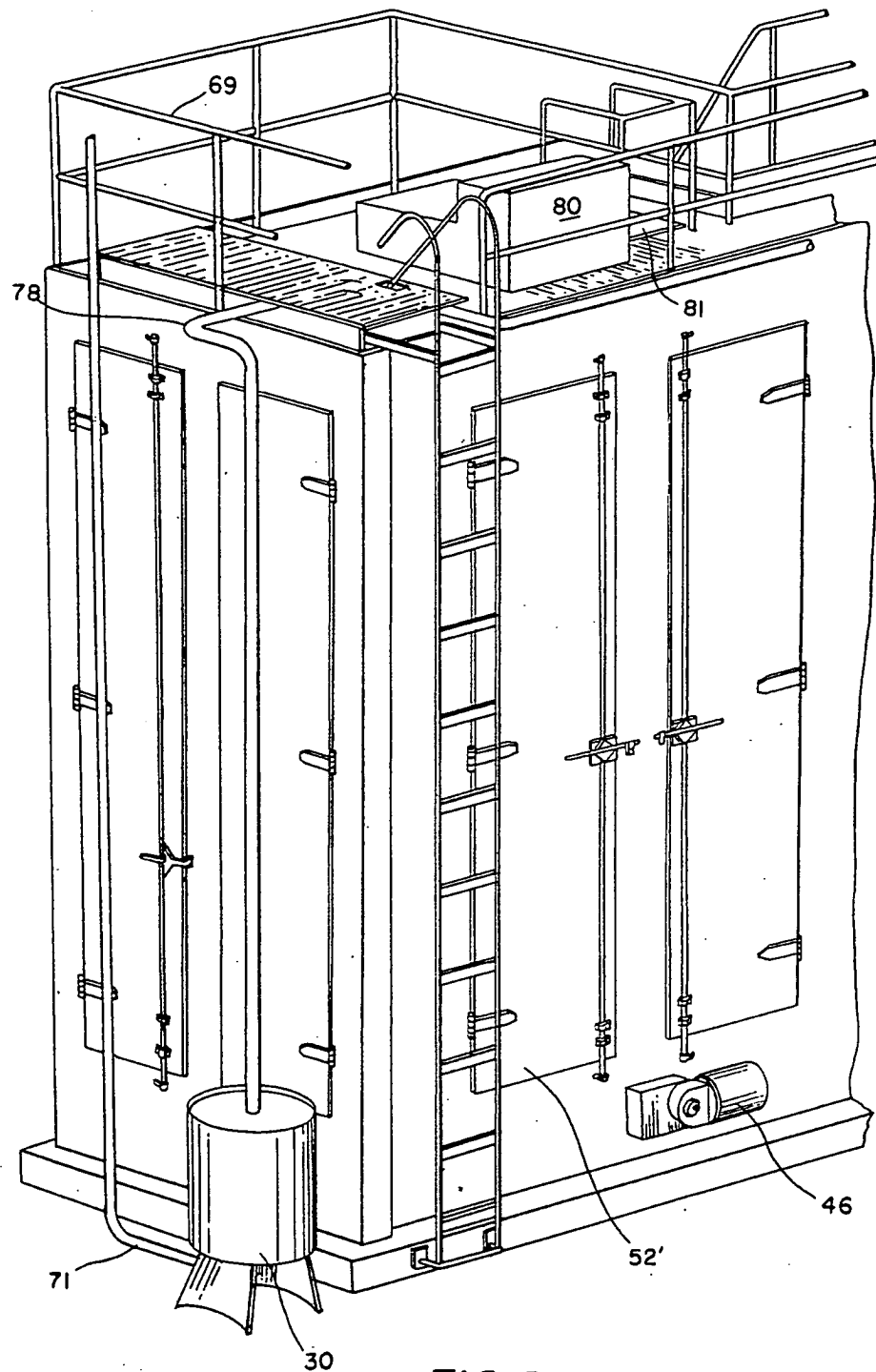


FIG. 6

# HIGH HUMIDITY STEAM COOKER WITH CONTINUOUSLY RUNNING CONVEYOR

## TECHNICAL FIELD

This invention relates to cookers and more particularly it relates to cookers through which are transported food products on a continuously moving conveyor belt.

## BACKGROUND ART

In the field of industrial cooking requiring the rapid cooking and throughput of large quantities of food it has been customary to pass the food through a cooker on a conveyor belt. Typical examples of such prior art are as follows:

U.S. Pat. No. 3,982,481—E. T. Console et al. This shows a chamber through which a conveyor belt passes to carry produce for blanching in a steam spray.

Certified Manufacturing, Inc., Lynwood, Calif. 90262 has marketed gas fired broilers with a conveyor belt transport therethrough.

U.S. Pat. No. 1,491,958—J. F. Logan et al., uses a spiral conveyor to transport food in cans through a dry heat chamber.

However, in this type of prior art there are many unsolved problems relating to the cooking, the efficiency and the sanitation of conveyor type cooking systems.

Thus, particularly with rapid cooking techniques, the juices, essences and moisture is withdrawn from food products changing the appearance, flavor and texture thereof.

Also the cooking may not be uniform to the center of such products as meat which needs be cooked at the inner bone structure.

In general the food products present an interface to the heating medium that does not efficiently transfer heat, such as the fat skin layer of a piece of fowl. Also, such residue as fat drippings can significantly decrease heating efficiency.

Whenever a continuously running conveyor is used it tends to carry heat out of the cooker and cool air into it. This wastes energy and establishes an uncomfortable working environment for loading the conveyor.

Also the amount of energy carried out of a hood or exhaust system is significant, and in the case of steam heat for example, there can be significant heat loss by condensation of the steam into droplets.

The conveyor belts are difficult to sanitize, particularly in those systems that pass the belt back through the cooker to bake on residue. Other movable and irregularly shaped parts in or near cookers are apt to accumulate contaminating residue and breed bacteria. Also accessibility of the systems is in many cases difficult for takedown and entry into interior compartments for cleaning and sanitation.

Accordingly, it is an object of this invention to provide an improved, efficient, sanitary conveyor type cooker for food products that resolves the foregoing problems, and provides other features and advantages which will be found throughout the following text.

## BRIEF DISCLOSURE OF THE INVENTION

Food products such as fish, meat, fowl or produce are carried on a conveyor belt in a spiral path through a steam cooking chamber. The chamber is kept near 100° C. and 100% humidity by two steam sources both supplied with pure water and at a pressure above atmo-

spheric in order to produce efficient rapid cooking without loss of humidity and with protection to appearance and flavor.

One steam source comprises a heat exchange surface in a pool of water on the floor of the chamber stirred to create heating efficiency and to skim off fat drippings from chicken or meat products. The other externally located steam generator has steam piped into the chamber.

The continuously running conveyor belt is passed on a return path outside the cooker through a continuously run spray detergent cleaning and sanitizing bath, and the internal parts of the cooker are all accessible by doors on all sides thereof. Driving machinery and elements requiring lubrication are all located outside the cooker to present simple sanitary surfaces for cleaning and sanitation. An internal cleaning spray system is also provided.

Other features are found hereinafter in the more detailed description of the preferred embodiment.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a system schematic diagram showing the various features of the invention;

FIG. 2 is a side elevation sketch of the cooker cabinet afforded by the invention;

FIG. 3 is a diagrammatic view, partly broken away, of a continuous conveyor belt spray cleaner afforded by the invention;

FIG. 4 is a diagrammatic view in perspective, partly broken away, showing the spiral conveyor path within the cooker as afforded by this invention;

FIG. 5 is a diagrammatic view in perspective, partly broken away, showing the steam supply means for the cooker as afforded by this invention; and

FIG. 6 is a perspective view of the cooker cabinet array as provided by this invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The overall system and combinational aspects of the cooking system provided by this invention are set forth in FIG. 1. Thus, it is seen that food products 10 to be cooked are loaded on a conveyor belt 11 at the loading station 12 outside the cooker room wall 13. Preferably the food products are substantially uniform in size and weight such as chicken legs, sized fish filets, steaks, etc. The products thus are loaded on the conveyor belt 11 at atmospheric pressure at loading station 12 outside the cooker room 14 which is kept at a pressure above atmospheric. This not only keeps the working conditions more comfortable but improves the cooking efficiency as hereinafter shown.

The products first undergo an optional pure water spray mist process at station 15 to wet the surface of the products for better heat interface exchange with the steam inside cooker housing 16. It should be recognized that particularly in the case of meat products which are covered by a fat, this wetting step is important to reduce the insulation characteristics and to achieve more efficient and rapid cooking.

The products are then passed through a duct 17 or opening in upper part of the cooker housing and through a spiral conveyor path 18 to assure the proper dwell time within the cooker at the chosen conveyor speed. The conveyor belt is of stainless steel for sanitary

purposes and is not lubricated, since that would introduce contamination for food products.

The conveyor exits the cooker housing 16 at a lower duct 19 which is in the form of a trap reducing the steam and heat energy leaving the cooker on the conveyor belt 11. Thus baffles 20 resist flow of hot air or steam out of the cooker housing 16 and fan 21 creates a counter flow of air at least sufficient to prevent any significant unnecessary outward flow of heat energy by way of gases carried outwardly by conveyor 11. This fan can control the rate of fresh air flow into cooker housing 16 as later discussed.

The cooked food products 10' are then conveyed to unloading station 22 outside cooker room 14 on the outside of wall 23. The conveyor belt is typically wide enough for several side-by-side pieces of meat, produce, fish or poultry, for example, and a typical throughput is over a ton of raw products per hour with typical cooking times of 20 minutes between input loading station 12 and output unloading station 22. The cooked product temperature is uniformly in the order of 97° C.

The cooking is solely with water droplet free steam near 100° C. and 100% humidity at a pressure above atmospheric. The high humidity atmosphere prevents losses of humidity of the product as it passes through the cooker and helps retain juices, essences and flavor of the product. Also it improves the heating steam interface heat exchange at the product surface for more efficient cooking.

The higher pressure not only produces a pressure-cooker like cooking efficiency to the cooking process, but is critical in connection with the flavor and conveyor type product flow as well. Thus, consider products loaded at the conveyor loading station 12 at atmospheric pressure when introduced into the cooking chamber will then tend to draw the steam internally within the cellular structure of the product for faster more intimate contact and quicker more uniform cooking throughout. This action also resists the leaking and removal of juices and essences of the product for better flavor control.

Part of the steam, typically 25%, is provided by an external steam generator 30 with filter to remove water droplets as supplied with pure water 31 to prevent contamination. This is piped to various locations 32, 33 within the cooker to assure a constant circulating flow of steam near 100% humidity 100° C. atmosphere about the products being carried on belt spiral 18. Also, for example, a jet 33 may flow steam in a direction counter the belt flow path to create a circulation path preventing undesired loss of steam out of duct 19 as the belt leaves the cooker, and together with fan 21 can create a desired ratio of input of outside air for circulation.

For this purpose an outlet stack 35 will let out of the cooking housing 16 an amount of steam flow controlled by valve means 36.

The remaining steam is provided by an internal boiler having the pool of water 40 on the floor of the cooking chamber as heated by the heat exchange element 41. To assure the right amount of steam and pressure within the cooking chamber, the power is controlled as a function of the temperature at the gas discharge stack 35 as sensed by temperature sensor 43.

For better steam producing efficiency the water in pool 40 is circulated by means such as paddle wheel 45 and electric motor 46. This is additionally used to improve steam production efficiency by creating a wave flow 47 travelling toward fat skimmer 48 which re-

ceives the crest of the waves on which the fat rides and removes the fat in the manner of a swimming pool skimmer mechanism. This prevents any accumulation of an insulating fat film on the pool 40 that prevents or reduces steam output, and further it removes a substance which could cause both sanitation and flavor problems if resident long in the cooker chamber. The fat is not thus broken down into a residue gas which would flavor the product adversely nor a scum which would not be easily sanitized. Also the fat may constitute a useable by-product.

To further improve sanitation, those elements which require lubrication or access for maintenance are located outside the cooking chamber, as exemplified by motor 46 and belt conveyor drive mechanism 49. Also the belt 11 is returned from unloading to the loading station outside the cooking chamber as shown by the view of FIG. 2 where there is a niche 50 in the cooker housing 16 to permit a short return path through a conveyor duct 51. The access doors 52 are supplied on all sides of the housing for accessibility for maintenance and sanitation.

Additionally a detergent spray system provides for continuous cleaning of the belt at 55 and for a spraying of the cooking chamber as depicted at spray outlet 56 with a sanitary detergent solution.

The belt cleaning spray mechanism is shown in detail in FIG. 3, which with all succeeding figures uses similar reference characters for common features to facilitate comparison.

Installed in the return duct 51' about the stainless steel conveyor belt 11 is a spray wash unit 55 powered by continuously running motor-pump 57. The belt has interconnected stainless steel segments which permit travel around guide rollers 58, 59 and other flow paths within the system. The conveyor belt 11 has a central open grating upon which the products rest which permits steam and detergent spray solution 60 to flow through the belt into sump 61 for recirculation by motor-pump 57.

Sufficient spray nozzle arms 62 are provided with nozzle construction and spray pressure such as to dislodge any crumbs or drippings of the product remaining on the belt after cooking and unloading. A sanitary detergent solution is used to provide a sanitary belt for receiving a new loading of products at station 12 without contamination from the continuously running belt. Because the belt 11 does not return through the cooker, there is less tendency to bake on any residue and the cleaning function is simplified. Brushes may be used if desired and the brush 64 removes moisture from the roller 58 to keep the belt drier. It dries rapidly because it is warm after leaving the cooker and the reduced atmospheric pressure outside wall 13 permits quick evaporation of residue moisture. The solution in sump 61 is filtered for removing residue before recirculation by the pump, and the detergent solution can be changed as often as necessary to maintain strict sanitary conditions without possibility of introducing bacteria or retaining contaminating residue. Note all mechanisms such as pump 57 are kept outside the sanitary cooking compartment and ductwork 17', 51' keeping any foreign substances off the belt 11.

Features shown in FIG. 4 include the spiral path 18 taken by the belt 11 through the cooker chamber, access doors 52, etc. for internal access, maintenance and sanitation and the placement of drive means such as chain sprocket 68 for driving the conveyor belt through the



spiral path 18 and its associated drive mechanisms. The catwalk array 69 gives a size perspective of the cooker housing 16, and provides access to top entry panels and the mechanism 68 for maintenance. The spiral belt path may have as many convolutions as necessary to retain particular specialty products within the cooking chamber a desired dwell time for the desired belt travel speed.

Details of the heating mechanisms are shown in FIG. 5. For sanitary purposes stainless steel is used wherever possible and the interior walls of the housing 16 are smooth to avoid any surfaces that could cause dripping or collect contamination. The interior 70 of the housing walls is insulated to preserve heat and to produce a safe and lower temperature outside wall environment around operational personnel.

The steam generator unit 30 could be any standard commercially available steam generator unit and is preferably made of stainless steel. It is coupled to a boiler for a supply of sanitary steam from pure water by means of piping 71. Approved pure water make-up is entered from source 31 to assure sanitary steam. All piping is stainless steel sanitary steam pipe with pipe insulation having sanitary jacketing.

The floor water may be pumped out by pump 75 through drain 76 when sanitizing by detergents from piping 56.

The fat skimmer duct 48 has internal baffling to reduce the loss of hot water and it leads to a settling tank (not shown) for segregation of fats.

The external steam is preferably disposed through piping 78 to the four corners of the cooking chamber and steam is released at nozzles 32', 33' or along the length of the piping such as shown at 79 to provide proper mixture and saturation along the spiral conveyor path with the steam evaporated from the lower water pool.

Externally the cooking cabinet 16 is shown in FIG. 6. The top housing 80 encloses the mechanisms for driving the spiral conveyor system within housing 16 and the top access door 81 permits entry for maintenance, inspection, sanitation and the like.

It is therefore evident that the steam cooking system provided by this invention has advanced the state of the art and provided many improved features. Those novel features believed descriptive of the spirit and nature of the invention are set forth with particularity in the appended claims.

#### INDUSTRIAL APPLICATION

Large volumes of food products are processed on a continuously running conveyor belt passing through an energy efficient steam cooker which preserves product humidity, flavor and appearance. Thus, fish, meat, poultry, produce and like food products can be cooked. There are self-cleaning and apparatus features for meeting the strictest of sanitation requirements.

I claim:

1. A food cooking system cooking solely with steam foods such as fish, fowl, meats or produce carried through a cooker on a continuously running conveyor belt, comprising in combination, a cooker housing, means passing said conveyor belt through said housing to expose food products within the cooker housing only to said steam as the sole cooking medium, and two sources of steam providing said steam to cook the food products, nozzles for releasing steam located inside said housing, one comprising a steam generator supplying

supplemental steam into said housing at said nozzles located therein to maintain the atmosphere together with the other steam source at near 100% humidity 100° C. and a pressure above atmospheric, and the other source of steam comprising a pool of water within said housing with heating means for boiling the water to create steam.

2. The system defined in claim 1 having a steam exhaust pipe, and heat control means for said pool of water regulated as a function of the temperature at said exhaust pipe.

3. The system defined in claim 1 having an opening in said housing into which said conveyor belt passes, and means establishing said steam pressure at a sufficient magnitude to discharge steam at a controlled rate from said housing about the entering conveyor belt.

4. The system defined in claim 3 with an opening in said housing out of which the conveyor belt passes, and having a steam flow path created within said housing by said nozzles tending to draw air into the latter said opening to produce a flow path out of the former opening thereby circulating air and steam.

5. A system as defined in claim 1 including means driving said conveyor belt through said housing with all mechanisms requiring lubrication mounted in a compartment outside the housing thereby to avoid food contamination.

6. A system as defined in claim 1 wherein the housing is positioned within a secondary housing such as a room where the pressure is maintained above atmospheric.

7. A system as defined in claim 6 including a station for loading food products through which said conveyor belt passes outside said secondary housing so that the food products are maintained at atmospheric pressure until they enter the cooker system whereby the increased pressure and high humidity cause efficient penetration of heat into the products to cook them evenly throughout by establishing a temperature approaching 100° C.

8. A system as defined in claim 1 adapted for processing meat and fowl products which may drip fat into said pool of water, including means continuously skimming the fat from the top of the water to improve the steam capacity thereof.

9. A system as defined in claim 8 wherein the fat skimming means comprises a paddle wheel on one side of the pool generating waves travelling to the other side of the pool and a fat skimmer receiving the crest of the waves and fat residing therein and removing such from the pool of water.

10. A system as defined in claim 8 wherein the heating means for the pool of water comprise heat exchange elements at the bottom of said housing, including means circulating the water over said heat exchange elements to improve the effective steam output efficiency.

11. A system as defined in claim 1 wherein said housing has access doors for entry therinto on all sides.

12. A system as defined in claim 1 wherein the conveyor belt is passed inside said housing in a spiral path coiling downwardly to carry said foods through said housing from an upper to a lower position in said near 100% humidity atmosphere which prevents water dripping downwardly upon the foods being cooked on the belt.

13. A system as defined in claim 1 including means pre-moistening the food products on said conveyor belt before entry into said housing to thereby create an effi-

cient heat interchange surface on the food products for heating by said steam.

14. The system defined in claim 13 wherein the conveyor belt path passes from a loading station at atmospheric pressure into an enclosure above atmospheric

pressure and said moistening means comprises means located within said enclosure producing a fine spray mist covering the surface of the food product on the belt without droplets or steaming.

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